EPB Supp √7.294/A

Bound by Starr Bookworks

MANUAL

OF

PRACTICAL TOXICOLOGY.

MANUAL

OF

PRACTICAL TOXICOLOGY:

CONDENSED FROM

DR. CHRISTISON'S TREATISE ON POISONS.

WITH NOTES AND ADDITIONS

BY

J. T. DUCATEL, M.D.

PROFESSOR OF CHEMISTRY AND PHARMACY IN THE UNIVERSITY OF MARYLAND—MEMBER OF THE AMERICAN PHILOSOPHICAL SOCIETY—HONORARY MEMBER OF THE PHILADELPHIA COLLEGE OF PHARMACY—A VICE PRESIDENT OF THE MD. ACADEMY OF SCIENCE AND LITERATURE—CORRESPONDING MEMBER OF THE GEORGOFILI OF FLORENCE, OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, COLUMBIAN INSTITUTE AT WASHINGTON, &C. &C.

BALTIMORE:
WILLIAM & JOSEPH NEAL.
1833.

1862, Dec. 4.
Gift of
[illegible] Wells,
of Boston.

Entered, according to the Act of Congress, in the year 1833, by
William and Joseph Neal,
in the Clerk's office of the District Court of Maryland.

J. D. TOY, PRINTER.

TO

RICHARD S. STEUART, M.D.

WHO SUGGESTED THE USEFULNESS OF

A WORK

ON THE PLAN OF THE ONE

NOW OFFERED TO THE MEDICAL PROFESSION,

THIS MANUAL IS INSCRIBED,

BY HIS FRIEND,

J. T. D.

PREFACE.

The present Manual is, in a great measure, merely an abridgment of Dr. Christison's elaborate Treatise on Poisons, already so advantageously known to the medical profession of this country. But, considerable alterations having been freely made in the form of that treatise, it becomes necessary to assign the motives that have led to the offering of this substitute, in some respects, for the excellent work from which it has been compiled.

The two objects had in view in preparing this Manual, were, to furnish the medical *student* with a cheap work on one of the most practical branches of his studies, and to supply the medical *practitioner* with an easier means of reference, than it is believed he has hitherto possessed, to that kind of information, on which he is called to act, most frequently, with the least hesitation. The advantage, which it is presumed that both may derive from it, is the possession of a portable volume, containing the most important facts, relating to the action of poisons on the human economy, to the treatment of their effects, and to the morbid appearances which their fatal operation leaves upon the dead body; arranged in strict accordance with a system of classification; and treated of in the order in which an inquiry into these facts would most naturally suggest.

It will readily be perceived, that the principle by which the author has been guided in condensing Dr. Christison's Treatise, will have required some departures from the text of that work. It has also been found necessary to limit the selection of facts to such as belonged to *practical* toxicology alone.

Thus, it was thought proper to omit that portion of each chapter in the treatise, which relates to the chemical history and the tests for the several poisons; because, such information, although indispensably necessary to the medical jurist, can seldom be made available by a physician practising at the bed side of a patient laboring under the effects of a poison. The general acquaintance which every medical man has, with the nature and properties of the substances that are likely to produce cases of poisoning, will be found, perhaps, always sufficient, whenever such knowledge can be of any service independently of the facts furnished by the circumstances of the case, or by the pathological symptoms that arise from it. On the other hand, however, due stress has been laid on the chemical action of the *antidote* to the poison; and whenever this was not indicated by Dr. Christison, it has been added in a note.

For the same reason—namely, because of its more immediate importance to the medical jurist—the chapter "on the evidence of general poisoning," has been overlooked; excepting on a few points, which have served more fully to illustrate what has been termed the physiological action of poisons. The chapter, "on imaginary, pretended, and imputed poisoning," as a necessary consequence of this principle, has been entirely omitted. Not so, however, with the accounts of the morbid appearances induced by the different poisons. Because, besides that they will be admitted to afford not unfrequently a strong circumstance in discovering the nature of the agent that has been committing its ravages—as when there are several sufferers, and perhaps one has already perished—they moreover are useful to the physician, as furnishing him, in many cases, with a means of satifying himself, and others, of the propriety of his mode of treatment though unsuccessful, as well as of ascertaining the causes which may have baffled his exertions. The morbid appearances are too, the complement of the information which a *practical toxicologist* should possess.

It has already been stated, that the present Manual is offered, as a substitute in some respects only, for Dr. Christison's Treatise.—Hence, being more limited in its object, certain changes in the arrangement also of the matter which it contains, though textually the same as in the Treatise, were rendered indispensably necessary in order that it should better fulfil its special intentions. These changes consist, in an entirely new distribution of the matter into chapters, sections, sub-sections, and numbered paragraphs, and in, it is thought, a more methodical division of the subject, with a view to facilitate the means of reference to the contents of the work. It was likewise deemed advisable to confine the illustration of the action of the several poisons, to an account of the most characteristic cases; and, for the sake of brevity, without referring to the authors who have supplied them, but always with proper regard to the authenticity of the source from which they have been derived. In this latter respect unbounded confidence has been placed in the decisions of Dr. Christison.

The subject of the adulteration by copper and lead of articles of food and drink, which must be of so much interest to the medical practitioner, is treated of in two Appendices. The information therein contained is also principally taken from Dr. Christison's Treatise.

The Notes and Additions to the Manual consist chiefly of explanatory observations on the text, which is to be understood as exclusively compiled from Dr. Christison's Treatise; a Tabular View of the class of Irritant Poisons; references to the chief pharmaceutical and artificial preparations containing ingredients ranked among poisons; fuller accounts of the mode of treatment for several poisons, principally as regards the chemical treatment by antidotes; descriptions of the botanical characters of the poisonous families of plants, of which the most common genera and species are mentioned, and those indigenous to America inserted, and their properties specified; and some additional facts concerning the singularly corrosive effects of chromic acid, and the poisonous properties of its salts.

Finally, a very copious index has been added: and the author may here be permitted to return his grateful acknowledgments to his friend, Mr. William R. Fisher, graduate of pharmacy, for the services rendered in the preparation of that part, and in a general revision of other portions of the work. Indeed, had not such services been obtained, it is not probable that the Manual would at this time be published. It was commenced in the course of last winter, and before its completion, the author was entrusted with a public function, in the discharge of which his repeated absences from the city became indispensably necessary. So that, had not the work been previously promised to appear in the fall of the present year, its publication would have been delayed until it could receive a more thorough revision from the author himself. As it is, a hope is still entertained that its usefulness will not be found impaired by errors of any magnitude.

BALTIMORE, *Oct.* 1, 1833.

TABLE OF CONTENTS.

CHAPTER I.

Page

On the Physiological Action of Poisons, - - 21

Sec. I. On the Mode of Action of Poisons, - - 21

II. On the causes which modify the action of Poisons, - - - - - - - 25

CHAPTER II.

On the general Treatment of Poisoning, - 33

CHAPTER III.

On the classification of Poisons, - - - 37

Tabular view of the class of Irritant Poisons, 38

CHAPTER IV.

On Irritant Poisons generally, - - - 44

Sec. I. Of the Pathological symptoms of the Irritant class of Poisons, - - - - - 44

II. Of the Morbid Appearances caused by the Irritant Poisons, - - - - - - - 48

CHAPTER V.

Sec. I. On the Mode of Action of the Mineral Acids, and the Pathological symptoms they cause in Man, - - - - - - 50

II. Of the Treatment of Poisoning with the Mineral Acids, - - - - - 55

Sec. III. Of the Morbid Appearances caused by the Mineral Acids, - - - - - - 56
IV. On Poisoning with Phosphorus and the other Bases of the Mineral Acids, - - - 60
V. On Poisoning with Iodine and Bromine and their Compounds, - - - - - - 63
Sec. VI. On Poisoning with Oxalic Acid, - - - 66
1. On the Action of Oxalic Acid, and the Pathological symptoms it causes in Man, 66
2. Of the Treatment of Poisoning with Oxalic Acid, - - - - - - 71
3. Of the Morbid Appearances caused by Oxalic Acid, - - - - - - 71
VII. On Poisoning with Acetic Acid, - - - 73

CHAPTER VI.

Of Poisoning with the Irritant Gases, - - 75
1. Of Nitric Oxide Gas and Nitrous Acid Vapor, - - - - - - 75
2. Of Hydrochloric Acid Gas, - - - 77
3. Of Chlorine, - - - - - 77
4. Of Ammoniacal Gas, - - - - 78
5. Of Sulphurous Acid Gas, - - - 78

CHAPTER VII.

Group First. Of the Alkalis and Alkaline Salts, 80
Sec. I. Of the Fixed Alkalis and their Carbonates, - 81
1. Of the Action of the Fixed Alkalis, and the Pathological symptoms they cause in Man, - - - - - - 81
2. Of the Treatment of Poisoning with the Fixed Alkalis, - - - - - 84
3. Of the Morbid Appearances caused by the Fixed Alkalis, - - - - - 84
II. Of the Alkaline Nitrates and of Lime, - - 85
1. Of the Action of Nitrate of Potassa and its Pathological Symptoms in Man, - 86

2. Of the Morbid Appearances caused by Nitrate of Potassa, - - - - 89
3. Of the Action of Nitrate of Soda, - - 89
4. Of the Action of Lime, - - - 89
Group Second. Of Ammonia, with its Salts, and the Alkaline Sulphurets, - 90
Sec. I. Of Ammonia and the Ammoniacal Salts, - 91
1. Of the Action of Ammonia and the Ammoniacal Salts, and their Pathological Effects on Man, - - - - - - 91
2. Of the Morbid Appearances caused by Poisoning with Ammonia, - - - 94
3. Of Poisoning with Muriate of Ammonia, 94
Sec. II. Of the Alkaline Sulphurets, - - - 95
1. Of the Action of the Sulphuret of Potassa and the Sulphuret of Soda, and their Pathological symptoms in Man, - - 95
2. Of the Treatment of Poisoning with the Alkaline Sulphurets, - - - 97
3. Of the Morbid Appearances caused by the Alkaline Sulphurets, - - - 97

CHAPTER VIII.

Sec. I. On Poisoning with Arsenic, - - - 99
1. On the Mode of Action of Arsenic, and the Pathological Symptoms it excites in Man, 99
2. Of the Treatment of Poisoning with Arsenic, - - - - - - 108
3. Of the Morbid Appearances caused by Arsenic, - - - - - - 112
Sec. II. On Poisoning with Mercury, - - - 118
1. Of the Mode of action of Mercury and the Pathological symptoms it excites in Man, 118
2. Of the treatment of poisoning with Mercury, - - - - - - 127
3. Of the Morbid Appearances caused by Mercury, - - - - - - 129

Sec. III. Of Poisoning with Copper, - - - 132
1. Of the Action of Copper, and the Pathological Symptoms it excites in Man, - 132
2. Of the Treatment of Poisoning with Copper, 134
3. Of the Morbid Appearances caused by Copper, - - - - - - 134
Sec. IV. Of Poisoning with Antimony, - - - 136
1. Of the Action of Antimony, and the Pathological symptoms it excites in Man, 136
2. Of the Treatment of Poisoning with Antimony, - - . - - - 138
3. Of the Morbid Appearances produced by Antimony, - - - - - 139
Sec. V. Of Poisoning with Tin, - - - - 140
VI. Of Poisoning with Silver, - - - - 140
VII. Of Poisoning with Gold, - - - 141
VIII. Of Poisoning with Bismuth, - - - 141
IX. Of Poisoning with Chromium, - - 143
X. Of Poisoning with Zinc, - - - - 145
XI. Of Poisoning with Lead, - - - 147
1. Of the Action of Lead, and the Pathological symptoms it excites in Man, - - 147
2. Treatment of Poisoning with Lead, 152
3. Of the Morbid Appearances caused by Lead, - - - - - - 154
Sec. XII. Of Poisoning with Barium, - - - 156
1. Of the action of the Barytic Salts, and the Pathological symptoms they excite in Man, 156
2. Of the Treatment of Poisoning with the Salts of Baryta, - - - - - 157
3. Of the Morbid Appearances caused by the Salts of Baryta, - - - - 158
XIII. Of Poisoning with Strontium, - - 158
XIV. Of Poisoning with Osmium, Platinum, Iridium, Rhodium, and Palladium, - - - 159
XV. Of Poisoning with Molybdenum, Manganese, Uranium, and Cobalt, - - - 159

Sec. XVI. Of Poisoning with Tungsten, Cerium, Cadmium, Nickel, and Titanium, - - 160
XVII. Of Poisoning with Iron, - - - 161

CHAPTER IX.

Group First. Of Poisoning with the Vegetable Acrids, - - - - 163
1. Of the Mode of Action of the Vegetable Acrids, and the Pathological Symptoms they excite in Man, - - - 163
2. Of the Morbid Appearances caused by the Vegetable Acrids, - - - - 165
Sec. I. Of Poisoning with the Ranunculaceæ, - 165
II. Of Poisoning with the Cucurbitacæ, - - 169
III. Of Poisoning with the Tithymaloidæ, - 173
IV. Of Poisoning with Mezereon, - - - 176
V. Of Poisoning with Daffodil, - - - 177
VI. Of Poisoning with Jalap, - - - - 178
VII. Of Poisoning with Savin, - - - 179
VIII. Of Poisoning with Pepper, - - - 181
Group Second. Of Poisoning with the Animal Acrids, - - - - 183
Sec. I. Of Poisoning with Cantharides, - - - 183
1. Of the Action of Cantharides, and the Pathological Symptoms it excites in Man, 183
2. Of the Treatment of Poisoning with Cantharides, - - - - - - 187
3. Of the Morbid Appearances caused by Cantharides, - - - - - 187
Sec. II. Of the Deleterious Effects of Poisonous Fish, 188
III. Of Poisoning by Venomous Snakes, and the Sting of Insects, - - - - 190
IV. Of Poisoning by Diseased and Decayed Animal Matter, - - - - - 193
1. Of Animal Matter rendered Poisonous by Diseased Action, - - - - 193

2. Of Animal Matter rendered Poisonous by common Putrefaction, - - - 197
3. Of Animal Matter rendered Poisonous by modified Putrefaction, - - - 198

CHAPTER X.

Sec. I. Of the Narcotic Poisons generally, - - 203
II. Of Poisoning with Opium, - - - 205
1. Of the Action of Opium, and the Pathological Symptoms it excites in Man, 205
2. Of the Treatment of Poisoning with Opium, 211
3. Of the Morbid Appearances caused by do. 217
Sec. III. Of the Action of Morphia, Narcotine, and Meconic Acid, - - - - - 219
IV. Of Poisoning with Hyoscianus, Lactuca, and Solanum, - - - - - 221
Sec. V. Of Poisoning with Hydrocyanic Acid, - 225
1. Of the Action of Hydrocyanic Acid, and the Pathological Symptoms it creates in Man, - - - - - - 225
2. Of the Treatment of Poisoning with Hydrocyanic Acid, - - - - - 229
3. Of the Morbid Appearances produced by Hydrocyanic Acid, - - - 231
Sec. VI. Of Poisoning with the Vegetable Substances containing Hydrocyanic Acid, - 233
1. Of Poisoning with Bitter Almond, - 234
2. Of Poisoning with Cherry Laurel, - 236
3. Of Poisoning with the Peach, Cluster-cherry, and some other plants of the same natural order, - - - - 238
4. Of Poisoning with the Mountain Ash, 240
Sec. VII. Of Poisoning with the Narcotic Gases, - 240
1. Of Poisoning with Sulphuretted hydrogen Gas, - - - - - - 240
2. Of Poisoning with Carburetted Hydrogen, 244

3. Of Poisoning with Carbonic Acid Gas, 244
4. Of Poisoning with Carbonic Oxide Gas, 248
5. Of Poisoning with Nitrous Oxide Gas, 249
6. Of Poisoning with Cyanogen Gas, - 249
7. Of Poisoning with Oxygen Gas, - 250

CHAPTER XI.

SEC. I. Of the Narcotico-Acrid Poisons generally, 251
II. Of Poisoning with Nightshade, Thorn-Apple, and Tobacco, - - . - . 253
1. Of Poisoning with Deadly Nightshade, 254
2. Of Poisoning with Thorn-Apple, - 259
3. Of Poisoning with Tobacco, - - 260
SEC. III. Of Poisoning with Hemlock and Fool's Parsley, 263
1. Of Poisoning with common Hemlock, 263
2. Of Poisoning with Water-Hemlock, - 265
3. Of Poisoning with Hemlock Dropwort, 266
4. Of Poisoning with Fool's Parsley, - 267
SEC. IV. Of Poisoning with Plants of the order Ranunculaceæ, - - - - - - 268
1. Of Poisoning with Monkshood, - 268
2. Of Poisoning with Black Hellebore, - 270
SEC. V. Of Poisoning with Emetia, - - - 271
VI. Of Poisoning with Squill, White Hellebore, Meadow Saffron, and Foxglove, - 272
1. Of Poisoning with Squill, - - 272
2. Of Poisoning with White Hellebore, - 273
3. Of Poisoning with Meadow Saffron, 274
4. Of Poisoning with Foxglove, - - 275
SEC. VII. Of Poisoning with Strychnia, Nux Vomica, St. Ignatius Bean, Upas Tieute, False Augustura, Woorara, Ticunas, and Curare, 278
1. Of Poisoning with Strychnia, - - 279
2. Of Poisoning with Nux Vomica, - 280
3. Of Poisoning with St. Ignatius Bean, and Upas Tieute, - - - . - 284

4. Of Poisoning with False Augustura Bark, 285
5. Of Poisoning with Woorara, Ticunas, and Curare, - - - - - 287
Sec. VIII. Of Poisoning with Camphor, Cocculus Indicus, Upas Antiar, and Coriaria Myrtifolia, 288
1. Of Poisoning with Camphor, - - 289
2. Of Poisoning with Cocculus Indicus, 292
3. Of Poisoning with Upas Antiar, - 293
4. Of Poisoning with the Coriaria Myrtifolia, 293
Sec. IX. Of Poisoning with Mushrooms and Mosses, 294
1. Distinctive Characters of the Poisonous Fungi, - - - - - - 294
2. Of the Circumstances which modify the qualities of Esculent Fungi, - 295
3. Of the Poisonous Principle of the Fungi, 297
4. Of the Symptoms produced in Man by the Poisonous Fungi, - - - - 298
5. Of the Treatment of Poisoning with Mushrooms, - - - - - 304
6. Of the Morbid Appearances caused by poisoning with deleterious Fungi, 305
7. Of Poisoning with Mosses, - - 306
Sec. X. Of Poisoning with Diseased and Adulterated Grain, - - - - - - 306
1. Of Poisoning with Spurred Rye, - 307
2. Of Poisoning with Spurred Maize, - 310
3. Of Poisoning with Darnel-grass, - 310
Sec. XI. Of Poisoning with Alcohol, Ether, and Empyreumatic Oils, - - - - 311
1. Of Poisoning with Alcohol, - - 311
2. Of Poisoning with Sulphuric and Nitric Ether, - - - - - - 317
3. Of Poisoning with Empyreumatic Oils, 318

CHAPTER XII.

Of Compound Poisoning, - - - 320

APPENDIX A.

On the Adulteration by Copper of Articles of Food and Drink, - - - - - - - - 321

APPENDIX B.

On the Adulteration by Lead of Articles of Food and Drink, - - - - - - - - 325

General Index, - - - - - - - 333

A MANUAL
OF
PRACTICAL TOXICOLOGY.

CHAPTER I.

ON THE PHYSIOLOGICAL* ACTION OF POISONS.

1. UNDER this head is embraced the consideration of the mode in which poisons act, and of the causes by which their action is liable to be modified.

SECT. 1. *On the mode of action of Poisons.*

2. The action of a poison is considered, by Toxicologists, as *local* or *remote*, according as its effects are confined to the part where it is applied; or that they extend to distant organs of the animal body.

3. The *local* effects of poisons are of three kinds: 1. Some decompose chemically or corrode the part to which they are applied. 2. Others, without

---

*It would no doubt be deemed futile to institute a verbal criticism in this place, in relation to the term *Physiological* action of poisons. We will merely remark, that the chapter might perhaps have been better entitled, ON THE PHYSICAL ACTION OF POISONS.

immediately injuring its organization, inflame or irritate it. 3. Others neither corrode nor irritate, but make a peculiar impression on the sentient extremities of the nerves, unaccompanied by any visible change of structure.

4. Of the three varieties in the *local* effects of poisons—corrosion, irritation, and nervous impressions—the two first may take place in any tissue or organ: the nature of local nervous impressions, made by a poison on different tissues, is not so well understood.

5. The *remote* action of a poison is accomplished in two ways; either the local impression passes along the nerves to the organ secondarily affected, or the poison enters the bibulous vessels, mingles with the blood, and passes through the medium of the circulation.

6. In the former way poisons are said to act through *sympathy;* in the latter through *absorption.*

7. The latest researches in Toxicology tend to show that a few poisons act by sympathy without entering the blood, and that, although many do enter the blood, the operation even of these consists in an impression made on the sentient extremities of the nerves, and conveyed thence along their filaments to the brain, or other organs.

8. A sympathetic action takes place in the case of poisons, that manifestly injure the structure of the organ to which they are applied. The existence of such an action is *presumed*, in the instance

of the pure *corrosives*, and is more evident in the case of the *irritants* that are not corrosive.

9. A similar action is supposed to take place in some cases of peculiar local nervous impression, which are not accompanied by any visible derangement of structure. Such a mode of action is assigned to prussic or hydro-cyanic acid, and to strychnia, the active principle of nux vomica.

10. As regards the action of poisons by absorption, many of them seem to enter the blood, but it is not probable that any pass with the blood to pervade the structure of the organ acted on. The general rule with respect to the poisons which appear to enter the blood is, that they cannot be detected either in that fluid or in the animal solids.

11. Of the *organs* affected by the remote action of poisons, it appears, that some poisons, such as arsenic and mercury, affect at the same time a great number of the organs of the body. The greater number of poisons, however, act on the contrary on one or more organs only, not on the general system.

12. Of the poisons which act remotely through a sympathy of distant parts with an organic injury of the textures directly acted on, many appear to act sympathetically on the *heart* alone. The mineral acids afford examples of this kind.

13. Of the more numerous class of poisons which act remotely, either through the medium of the blood, or by the transmission along the nerves of an impression made on their sentient extremities,

some possess a very extended influence over the great organs of the body; others are much more limited in their sphere of action.

14. Some poisons of the latter kind act also chiefly, if not solely, on the *heart*. An example of this is the infusion of tobacco when injected into the anus.* Arsenic and oxalic acid act on various organs besides the heart.

15. Other poisons act on the *lungs;* although none are known which act on them alone. Of this kind are tartar emetic and corrosive sublimate. These poisons, however, produce important effects on other organs likewise.

16. A great number of the poisons, now under consideration, act on the *brain*. All narcotic poisons, and most of the narcotico-acrids are of this kind; but very frequently other organs are acted on at the same time, particularly the spine and heart.

17. Few poisons act specifically on the *spinal chord*. The only species which are known to possess such an action are nux vomica, the other species of plants which, like it, contain strychnia, and the false angustura bark.†

18. There is hardly a considerable organ in the body, except perhaps the *spleen* and *pancreas*, which is not acted on by some poison or another;

---

* Mr. Brodie found that four ounces of a strong infusion of tobacco injected into the anus of a dog, killed it in ten minutes by paralyzing the heart, as was evinced by the arterial condition of the blood in the aortal cavities.

† Which contains brucia.

and the action of some of them is complicated in an extreme degree. Examples of these will be given hereafter.

Sect. 2. *On the causes which modify the action of Poisons.*

19. The action of poisons may be modified, both in degree and in kind, by a variety of causes.

20. The most important of these causes are: *quantity;* state of *aggregation;* state of *chemical combination; mixture;* differences in *tissue;* differences in *organ; idiosyncrasy; habit;* certain states of *disease; sleep;* and lastly, *the administration of other poisons.*

21. *Quantity* affects the action of poisons materially; for not only do they produce their effects more rapidly in large doses, but their action is sometimes even quite altered in kind. Thus oxalic acid, according to the dose, may corrode the stomach, or act on the heart, or on the spine, or on the brain. Arsenic, in a small dose, may cause gastritis of several days' duration; while a large dose may prove fatal in two or three hours, by affecting the action of the heart.

22. As to the state of *aggregation*, it is found that poisons act more energetically the more minutely they are divided; and hence most energetically when in solution. Some which are very energetic in the fluid state, hardly act at all when undissolved. Morphia, the alkaloid of opium, may be given in powder to a dog without injury, in a

dose, which, if dissolved in oil or alcohol, would soon kill several. Differences in aggregation, like differences in quantity, may affect the kind as well as the degree of action. Thus, camphor in fragments commonly causes inflammation of the stomach; dissolved in olive oil, it causes tetanus and coma. The reduction of certain poisons to the state of vapor serves the same end as dissolving them; and when poisons are to be introduced by the skin, the most effectual way is to reduce them to vapor.

23. *Chemical combination* operates as a modifying cause to the action of poisons in several ways. If the substance with which a poison is combined increases its solubility, it generally increases its activity, and *vice versa*. For example, morphia, itself almost inert, because insoluble, becomes active by uniting with acids; for they render it very soluble. Baryta, on the other hand, a very active poison, becomes inert by uniting with sulphuric acid; for the sulphate of baryta is quite insoluble. In regard to the influence of chemical combination, two general laws have been laid down. 1. *Poisons which only act locally, have their action much impaired, or even neutralized, in their chemical combinations.* Thus, sulphuric and muriatic acids on one hand, and the two fixed alkalis on the other, possess a violent local action; but if they be united, so as to form sulphates or muriates, although still very soluble, they become merely gentle laxatives.*

---

* Exceptions to this law present themselves in the compounds of *nitric acid* with the two fixed alkalis, (181,) and perhaps the *chromates of potassa*, (342.)

2. *The action of poisons which operate by entering the blood, although it may be somewhat lessened, cannot be destroyed or altered in their chemical combinations.* Ex. Morphia acts like opium, if dissolved in alcohol or fixed oil. If an acid be substituted as the solvent, a salt is formed which is endowed with the same properties. The sulphate, muriate, nitrate, and acetate of morphia, all act like opium. Strychnia, arsenic, hydrocyanic acid, oxalic acid, and many more come under the same denomination: each produces its peculiar effects, with whatever substance it is combined, provided it does not, by undergoing combination, become insoluble.*

24. The effect of *mixture* depends partly on the poisons being diluted. Dilution, by prolonging the time necessary for their being absorbed, commonly lessens their activity; but this is not always the case. For if a poison which acts through the blood, is also a powerful irritant, moderate dilution will enable it to enter the vessels more easily. Thus, a small dose of concentrated oxalic acid acts feebly as an irritant or corrosive; moderately diluted, it quickly enters the blood and causes speedy death.

---

* The second general law with regard to the influence of chemical combination, seems to require some limitation since the discovery, by *M. Donné*, of Paris, that iodine, bromine and chlorine, are antidotes for strychnia, and the other vegetable alkaloids. These electro-negatives, according to M. Donné, form compounds with the alkaloids that are not deleterious, though apparently not insoluble.

25. *Difference of tissue* is an interesting modifying power in a physiological point of view. Mineral poisons are least, and animal poisons are most affected in their action by differences of tissue, while vegetable poisons hold the middle place. On the corrosives and irritants a difference of tissue acts but indirectly: their effects vary not so much with the tissue as with the organ of which it forms part. But as to poisons which act through the blood, or on the inner coat of the blood-vessels, their energy must evidently depend on the activity of absorption in each tissue.

26. The *cutaneous* absorption is slow, on account of the obstacle presented by the cuticle, and by the intricate capillaries of the true skin. Accordingly, many active poisons are quite inert when applied to the unbroken skin, or even to the skin deprived of the cuticle. Most gaseous poisons, however, (such as carbonic acid and sulphuretted hydrogen,) and some solid poisons, (such as the bisulphuret of mercury,) when volatilized, will act, though simply placed in contact with the skin.

27. On the *mucous* membrane of the *stomach* and *intestines*, poisons act much more energetically than on the skin.

28. The *serous* membranes possess an activity of absorption which hardly any other unbroken texture can equal. Thus, many poisons act much more rapidly through the peritonœum than through the stomach.

29. There is no way in which poisons, that act

through the blood, prove more rapidly fatal, than by introducing them directly through a *wound* into a *vein*. Some cause death when thus applied to a wound in the minutest quantity, but are quite harmless when swallowed in large doses: others are diminished a little in activity, but still remain powerful and fatal poisons.

30. If in the application of poisons to a wound, the surface bleeds freely, they may not act at all, because they are washed away; but if they adhere, they soon enter the divided veins.

31. On the *mucous* membrane of the *pulmonary* air-cells and tubes, poisons act with a rapidity which is not surpassed by their direct introduction into a vein.

32. As to the *nervous* tissue, it is a singular fact, that the poisons which appear to act on the sentient extremities of the nerves, and indirectly through the nerves on the brain and spine, do not act at all on the cut surface of the brain and nerves, and upon any part of the course of the latter. This has been proved with respect to hydrocyanic acid, opium, strychnia, and all active narcotics.

33. The power of the *cellular* tissue, as a medium of absorption, has not been ascertained.

34. The variations caused by difference of tissue in the activity of poisons, is perhaps chiefly dependent on the relative quickness with which absorption goes on: but it may also be accounted for, by supposing that a part of the poison is decomposed—the change being *greatest* where absorption

is slowest, and the power of assimilation strongest, namely, in the stomach—and least where absorption is quickest, and assimilation almost wanting, namely in a wound. (29.)

35. With respect to differences arising from *differences of organ*, they are partly attributable to differences in tissue, but not altogether. For example, in the case of the pure corrosives or irritants, the injury caused will depend for its danger on the importance of the organ to the general economy of the body: thus, inflammation caused by a local poison in the stomach will be more quickly fatal than that excited in the intestines only; and such a poison may act violently on the external parts without materially impairing the general health.

36. The tendency of *idiosyncrasy* is generally to *increase* the activity of poisons, or even to render some substances deleterious to certain individuals, which to mankind in general are harmless, or even nutritive. The effect of this constitutional peculiarity is, on the other hand, sometimes to *impair* the energy of poisons; as in the instances of mercury and alcohol.

37. The tendency of *habit*, when it does affect the energy of poisons, is, with few exceptions, to *lessen* it. In this respect, it would appear that more change is effected by habit on the action of the *organic* than on that of the *inorganic* poisons; and that of the former, those which act on the brain and nervous system, and produce *narcotism*, are

altered in the most eminent degree. The best examples of the influence of habit are opium and vinous spirits. A very singular exception to this rule prevails, however, in the instance of tobacco, which, under the influence of habit, may be smoked and chewed daily to a considerable amount, and, so far as appears, without any cumulative effect on the constitution, like that of opium eating, or drinking spirits.

38. The effect of *disease*, like that of habit, is generally to *lessen* the activity of poisons. Hydrophobia always, tetanus, mania, hysteria, &c. sometimes, impair their activity. In the operation of this class of modifying agents, it is a general law, to which there are probably few exceptions, that it affects chiefly the poisons of the *organic* kingdom, and above all the narcotics. In the instance of most mineral poisons, its influence is very inferior. On the other hand, in a few diseased states of the system there is an *increased* susceptibility to the action of poisons. Thus, when a poison has a tendency to bring on a peculiar pathological state of the system, or of a particular organ, which is also produced by a disease existing at the time or impending, violent and even fatal consequences may ensue from doses of poisons, which, in ordinary circumstances, are innocuous or even beneficial.

39. It appears probable that *sleep* possesses the power of retarding for a while the action of some poisons. This is the case in regard to some of the

irritants; provided they be not at the same time powerfully corrosive. Thus some instances have occurred where arsenic, taken at night, did not begin to act for several hours; the individual having in the mean time been asleep.

40. Finally, as regards the *administration of other poisons*, when two poisons of different or opposite properties are administered about the same time, in poisonous doses, the effects of the one may overpower and prevent the operation of the other; or they may merely modify the action of one another. Examples of this law are furnished in cases of poisoning with alcohol and arsenic, alcohol and laudanum, laudanum and corrosive sublimate, tartar emetic and charcoal fumes, &c. (See chap. xii. on Compound Poisoning.)

CHAPTER II.

ON THE GENERAL TREATMENT OF POISONING.

41. POISONING may take place *internally* or *externally*.

42. In the instance of *internal* poisoning, the great object of the physician is to administer an antidote or counterpoison.

43. *Antidotes* are of two kinds.

44. One kind takes away the deleterious qualities of the poison before it comes within its sphere of action, by altering its chemical nature. These are called *chemical* antidotes.

45. The other kind of antidotes controls the action of the poison after it has begun, by exciting a contrary action in the system. Very few antidotes of this kind are known. It appears probable, however, that the remote operation of lead may be sometimes corrected by mercury given to salivation, and that the violent salivation caused by mercury may be occasionally corrected by nauseating doses of antimony.

46. The *chemical antidotes* operate in several ways, according to the mode of action of the poison for which they are given.

47. If the poison be a pure corrosive, such as a mineral acid, it will be sufficient that the antidote destroy its corrosive property. Thus the addition

of an alkali or earth will neutralize sulphuric acid and destroy, or, at least, prodigiously lessen its poisonous qualities. In applying this rule, care must be taken, however, to choose an antidote which is either inert, or, if poisonous, is like the poison for which it is given, a pure corrosive or local irritant, or one the properties of which are reciprocally neutralized.

48. If the poison, on the other hand, besides possessing a local action, acts remotely by an impression on the inner coat of the vessels, mere neutralization of its chemical properties is not sufficient; for such poisons act throughout all their chemical combinations which are soluble. (23.) And it is necessary that the antidote render the poison insoluble, or nearly so, not only in water, but likewise in the animal fluids, more particularly the juices of the stomach. The same quality is desirable even in the antidotes for the pure corrosives; for it often happens that in their soluble combinations these substances retain some irritating, though not any corrosive power.

49. In the instance of *external* poisoning, the main object of the practitioner is to prevent the poison from entering the blood, or to remove it from the local vessels which it has already entered.

50. One mode of effecting this, is by the application of *cupping glasses* to the part where the poison has been introduced.

51. A second mode is by the application of a *ligature* between the injured part and the

trunk, so as to check the circulation. By means of a ligature, which is removed for a short time at moderately distant intervals, a poison, which has been introduced into a wound beyond the reach of extraction, may be gradually admitted into the system in successive quantities, each too small to cause death or serious mischief, and be thus in the end entirely removed and destroyed. This mode is applicable in the case of poisons of the organic kingdom, which in a short time are either thrown off by the system or decomposed in the blood.

52. Finally: a third mode is by a combination of the ligature with venesection, according to the following method:

M. VERNIERE'S METHOD OF COMBINING THE LIGATURE WITH VENESECTION FOR EXTRACTING POISONS FROM A WOUND.

Suppose a fatal dose of extract of *nux vomica* to have been thrust into the paw of a dog; M. Verniere applies a tight ligature round the limb, next injects slowly as much warm water into the jugular vein as the animal can safely bear, and then slackens the ligature. The state of venous *plethora* thus induced completely suspends absorption.—The ligature is next tied, so as to compress the veins without compressing the arteries of the limb, and a vein is opened between the wound and the ligature, in such a situation that the blood which flows out must previously pass through, or at least near the poisoned wound. When a moderate quantity has been withdrawn, the ligature may be removed with safety; and the extraction of the poison may be proved by the blood that has been drawn being injected into the veins of another animal; for rapid death by tetanus will be the result. It is not improbable that in this plan the preliminary production of venous plethora may be dispensed with; and then the treatment may be easily and safely applied to the human subject.

CHAPTER III.

ON THE CLASSIFICATION OF POISONS.

53. Poisons may be divided into three classes—the *irritants*, the *narcotics*, and *narcotico-acrids*.

54. The class of *irritants* includes all poisons whose predominating symptoms are those of irritation or inflammation.

55. The class of *narcotics* embraces those which produce stupor, delirium, and other affections of the brain and nervous system.

56. The *narcotico-acrid* poisons are those which cause sometimes irritation, sometimes narcotism, and sometimes both together.*

---

* Orfila's class of septic or putrefiant poisons is judiciously discarded by Dr. Christison. Under this head Orfila embraces contagious miasmata, exhalations from burying grounds, hospitals, prisons, privies, &c. *sulphuretted hydrogen*, and the poison of venomous reptiles; but it will be seen that a place is readily found for all these in one of the three classes that have been adopted.

TABULAR VIEW

Of the Class of Irritant Poisons, *arranged according to the order in which they are treated of in this Manual.*

Class I.—Irritants.

Order 1.—Mineral Acids and their bases.
- Sulphuric acid.
- Nitric acid.
- Hydrochloric acid.
- Phosphoric A. phosphorus, sulphur, chlorine

Iodine and Bromine, with their compounds.
- Hydriodate of potassa.
- Hydrobomate of potassa.

Vegetable Acids.
- Oxalic acid.
- Acetic acid.

Order 2.—Irritant Gases.
- Nitric oxide gas.
- Nitrous acid vapor.
- Hydrochloric acid gas.
- Chlorine.
- Ammoniacal gas.
- Sulphurous acid gas.

Order 3.—Alkaline Poisons.

Group 1.—*Alkalis and alkaline salts.*
- Caustic potassa.
- Carbonate of potassa.
- Nitrate of potassa.
- Caustic soda.
- Nitrate of soda.
- Lime.

Group 2.—*Ammonia, ammoniacal salts, and alkaline sulphurets.*
- Aqua ammoniæ.
- Carbonate of ammonia.

Muriate of ammonia.
Sulphuret of potassa.
Sulphuret of soda.

Order 4.—METALLIC COMPOUNDS.

ARSENIC.

Fly powder.
Arsenious acid, *white arsenic.*
Arsenite of copper, *Scheele's green.*
Arsenite of potassa, *Fowler's solution.*
Arseniate of potassa.
Sulphurets of arsenic, *realgar*, *orpiment*, and *king's yellow.*

MERCURY.

Vapor of
Peroxide of mercury, *red precipitate.*
Bisulphuret of mercury, *vermillion*, *cinnabar.*
Protochloride of mercury, *calomel.*
Bichloride of mercury, corrosive-sublimate.
Turbith mineral.
Bicyanide of mercury, *prussiate of mercury.*
Nitrates of mercury.

COPPER.

Mineral-green, *verditer.*
Carbonate of copper, *rust of copper*, *natural verdigris.*
Sulphate of copper, *blue vitriol.*
Acetate of copper, *artificial verdigris.*

ANTIMONY.

Tartar emetic.
Chloride of antimony, *butter of antimony.*
Oxy-sulphurets of antimony, *glass*, *liver*, and *crocus of antimony.*
Hydrated oxy-sulphurets of antimony, *kermes mineral*, and *golden sulphuret.*

TIN.
  Oxide of.
  Protomuriate of.
  Permuriate of.
SILVER.
  Nitrate of.
GOLD.
  Muriate of.
  Fulminating gold.
BISMUTH.
  Nitrate of bismuth, *magistery of bismuth.*
  Tartrate of bismuth, *pearl white.*
CHROMIUM.
  Chromate of potassa.
  Bichromate of potassa.
  Chromate and bichromate of soda.
ZINC.
  Sulphate of zinc, *white vitriol.*
LEAD.
  Litharge.
  Deutoxide of lead, *red lead.*
  Carbonate of lead, *white lead, ceruse.*
  Acetates of lead, *sugar of lead, Goulard's extract.*
BARIUM.
  Carbonate of Baryta.
  Muriate of.
  Nitrate of.
STRONTIUM.
  Carbonate of Strontia.
  Muriate of.
  Nitrate of.
OSMIUM.
  Oxide of.
PLATINUM.
  Muriate of.

IRIDIUM.
  Muriate of.
RHODIUM.
  Muriate of.
PALLADIUM.
  Muriate of.
MOLYBDENUM.
  Molybdate of ammonia.
MANGANESE.
  Sulphate of.
  Manganesic acid.
URANIUM.
  Muriate of.
COBALT.
  Oxide of.
  Sulphate of.
TUNGSTEN.
  Tungstate of ammonia.
  Tungstate of soda.
CERIUM.
  Muriate of.
CADMIUM.
  Oxide of.
NICKEL.
  Sulphate of.
TITANIUM.
  Titanic acid.
IRON.
  Sulphate of iron, *copperas*, *green vitriol.*
  Muriate of.

Order 5.—VEGETABLE AND ANIMAL IRRITANTS.

Group 1.—*Vegetable acrids:*

RANUNCULACEÆ. *Crow-foot tribe.*
  Ranunculus acris. *Upright C.*
  Ranunculus sceleratus. *Celery-leaved Crow-foot.*

Anemone pulsatilla. *Pasque-flower.*
Caltha palustris. *Marsh marigold.*
Delphinium staphysagria. Stavesacre.
Delphinia.
Clematis. *Traveller's joy.*
Clematis flammula. *Virgin's bower.*
Trollius. *Globe flower.*

PAPAVERACEÆ. *Poppy tribe.*
Chelidonium major. *Celandine.*

CURCURBITACEÆ. *Gourd tribe.*
Bryonia alba. *Bryony.*
Bryonin.
Cucumis colocynthis. *Colocynth, bitter apple.*
Colocynthin.
Momordica elaterium. *Spurting cucumber.*
Elaterin.

EUPHORBIACEÆ. *Euphorbium tribe.*
Euphorbium. *Spurge.*
Euphorbium officinarum.
Euphorbium cyparissius.
Euphorbium lathyris.
Euphorbium esula.
Ricinus communis. *Castor-oil plant.*
Jatropa curcas.
Jatropa manihot. *Bitter casada.*
Hippomani mancinella. *Manchineel.*

THYMELÆÆ.
Daphne mezereon.
Daphne laureola. *Spurge laurel.*

Narcissus pseudo-narcissus. *Daffodil.*
Convolvulus jalapa. *Jalap.*
Convolvulus scammonea. *Scammony.*
Juniperus sabina. *Savin.*
Juniperus virginiana. *Red cedar.*
Gratiola officinalis. *Hedge-hyssop.*

Gamboge.
Sedum acre. *Biting stone-crop.*
Arum maculatum.
Arum triphyllum. *Indian turnip.*
Plumbago Europæa. *Toothwort.*
Pastinaca sativa. *Parsnip.*
Croton tiglium.
Piper nigrum, *Black pepper.*
Piper betel.
Piper siriboa.
Piper inebrians.
Piper cubeba. *Cubebs.*

Group 2.—*Animal acrids.*

CANTHARIDES.

POISONOUS FISH.
- Oysters.
- Muscles.
- Eels.

VENOMOUS SNAKES AND INSECTS.
- Viper.
- Rattlesnake.
- Scorpion.
- Tarantula.
- Bee and Wasp.

DISEASED AND DECAYED ANIMAL MATTER.
- Morbid secretions.
- *Pustules malignes.*
- *Milzbrand.*
- *Glanders.*
- Putrid animal matter.
- Saussage-poison.
- *Botulinic acid.*
- Cheese-poison.
- Bacon-poison.
- Oily matter about the fins of *Kipper*, or cured Salmon.

CHAPTER IV.

ON IRRITANT POISONS GENERALLY.

57. The class of irritant poisons comprehends both those which have a purely local irritating action, and likewise many which also act remotely, but whose prominent feature of action is the inflammation they excite wherever they are applied.

58. This class of poisons may be divided into five orders: the acids and their bases; the irritant gases; the alkaline poisons; the metallic compounds; and the vegetable and animal irritants.

Sect. 1. *Of the Pathological Symptoms of the Irritant Class of Poisons.*

59. The symptoms caused by the irritating poisons, when taken *internally*, are those of violent irritation and inflammation of one or more divisions of the alimentary canal.

60. The *mouth* is frequently affected, especially when the poison is easily soluble, and when it possesses a corrosive as well as irritating power. The symptoms referrible to the mouth are pricking or burning of the tongue, redness, swelling, ulceration both of the tongue and of the palate and lining membrane of the cheeks.

61. The *throat* and *gullet* are still more frequently affected; and the affection is for the most part burning pain, sometimes accompanied with constriction and difficulty of swallowing, and always with redness of that part of the throat and gullet which is visible. The affection of the throat and mouth precedes every other symptom when the poison is an active corrosive, and more particularly when it is either a fluid poison or one easily dissolved. Nay, sometimes burning pain of the mouth, throat, and gullet, occurs during the very act of swallowing. On the contrary, if the poison is soluble with difficulty, and is only an irritant, not a corrosive, and still more if it be only one of the feebler irritants, the throat is frequently not affected sooner than the stomach; occasionally, not at all.

62. The *stomach* is the organ which suffers most invariably from the operation of the irritant poisons. The symptoms referrible to their operation on it, are acute and generally burning pain, sometimes lancinating or prickling pain,—sickness, vomiting, tenderness on pressure, tension in the upper part of the belly, and occasionally swelling. Of these symptoms the swelling is generally the first to develope itself. In the instance of the corrosive irritants, the pain commonly commences along with it. The matter vomited is at first the contents of the stomach, afterwards tough mucus, streaked often with blood and mingled with bile, frequently clots of purer blood. The powerful corrosives affect the stomach the moment they are

swallowed; the irritants, which are either liquid or very soluble, also affect it very soon; but the more insoluble irritants, such as arsenic, generally do not begin to act till half an hour, or even more than a whole hour has elapsed.

The stomach may be affected without any other part of the alimentary canal participating in the injury; but, much more frequently other parts suffer also, and, in particular, the intestines.

63. The action of the irritant poisons on the *intestines* is marked by the pain of the stomach, extending over the whole belly, sometimes, even to the very anus. This pain, like that of the stomach, is often a sense of burning; but, it is also very frequently a pricking or tearing pain, and still more frequently a twisting and intermitting pain, like that of colic. It is seldom attended with swelling, but frequently with tension, and tenderness of the whole belly; and, at times, the inflammatory state of the mucous coat of the intestines, is clearly indicated by excoriation of the anus, and prolapsus of the rectum, which is of a bright red color. The pain of the bowels is most generally attended by purging, rarely with constipation, frequently with tenesmus. The matter discharged after the alimentary and fæculent contents have passed, is chiefly a mucous fluid, often abundant, often, also, streaked with blood or mixed with considerable quantities of blood.

In some cases the intestines are affected, when no other part of the alimentary canal is, not even the stomach. But, much more generally, the stomach and intestines are affected together.

64. In a few very aggravated cases of poisoning with the irritants, the whole course of the alimentary canal, from the throat to the anus, is affected at one and the same time.

65. A great number of the irritant poisons cause hoarseness, wheezing respiration, and other signs which indicate the spreading of the inflammation of the throat to the *wind-pipe;* some, likewise, cause darting pains throughout the *chest;* and not a few are very apt to cause strangury and other signs of inflammation of the urinary passages.

66. The symptoms of *internal* poisoning by the irritants are accompanied in almost every instance with great disturbance of the circulation—quick, feeble pulse—excessive prostration of strength, coldness and clammy moisture of the skin.

67. The most striking characters of the action of the irritants, when applied *externally*, are the following:—some produce merely redness, some cause blistering, others, bring out a crop of deep-seated pustules, others, corrode the tissues chemically, giving origin to a deep slough, and, others, excite spreading inflammation of the cellular tissue, under the skin, and between the muscles.

68. In the case of the vegetable acrids belonging to this class, when the poison is applied to a recent wound in the leg of an animal, great languor soon follows, and death takes place on the first or second day, without convulsions or any other symptom of note.

Sect. II.—*Of the Morbid Appearances caused by the Irritant Poisons.*

69. The powerful irritants, which are not corrosives, produce simply the appearances characteristic of inflammation of the alimentary canal in its various stages.

70. In the *mouth*, *throat* and *gullet*, they produce vascularity, and, also, if the case has lasted long enough, ulceration.

71. In the *stomach*, vascularity, extravasation of blood, under and in the substance of the villous coat, and, likewise, into the cavity of the organ; abundant secretion of tough mucus; deposition of coagulable lymph in a fine net work; ulceration of the villous or even of the other coats, occasionally perforation, preternatural softness of the whole or of part of the villous coat, and on the other hand, sometimes uncommon hardness and shrivelling of that coat.

72. In the *intestines*, vascularity, extravasation and ulceration. Sometimes all these appearances are to be seen in the whole alimentary canal at once. Thus, in poisoning with arsenic or corrosive sublimate, it is no unusual thing to meet with redness or ulceration of the throat, great disease in the stomach, vascularity of the small intestines, ulceration of the great intestines, and excoriation of the anus.

73. After poisoning by the mineral acids, the whole mucous membrane of the stomach is at times

found wanting. Nay, large patches of the whole coat may be wanting, and the deficiency supplied by the adhesion of the margin of the aperture to the adjoining viscera, and the conversion of the outer membrane of these viscera, into an inner membrane for the stomach.

CHAPTER V.

CLASS FIRST—ORDER FIRST.

74. THE first order of the class of irritant poisons, includes, four of the mineral acids—the *sulphuric*, *nitric*, *hydro-chloric* and *phosphoric*, with their bases, *phosphorus*, *sulphur*, and *chlorine; iodine* and *bromine*, with their compounds; and two of the vegetable acids—*oxalic* and *acetic* acids.

75. The *mineral acids* afford the purest examples of true corrosive poisons; their poisonous effects depending entirely on the organic injury they occasion in the textures to which they are applied.

SECT. I.—*On the Mode of Action of the Mineral Acids, and the Pathological Symptoms they cause in Man.*

76. The action of the strong mineral acids is independent of the function of absorption. (12.) They act by the conveyance along the nerves of an impression produced by the irritation or destruction of the part to which they are applied.

77. When introduced directly into a *vein*, they cause death by coagulating the blood. This is the case with sulphuric, nitric, and hydro-chloric acids.

78. If, on the contrary, they are introduced into the *stomach*, the blood as usual remains fluid for some time after death; the symptoms are referrible almost solely to the abdomen; and in the dead body the stomach is found extensively disorganised, and the other abdominal viscera sometimes inflamed. If the dose be large, and the animal fasting, death may take place in so short a time as three hours; but in general it lives much longer.

79. When the strong mineral acids are applied outwardly they irritate, inflame, or corrode the skin. The most rapid in producing these effects is the nitric, or rather the *nitrous* acid. The strong fuming nitrous acid even causes effervescence when dropped on the skin.

80. In *man* the symptoms, usually followed by death from violent corrosion and inflammation, are—all the symptoms that characterize the most violent gastritis, accompanied likewise with burning in the throat, which is increased by pressure, swallowing, or coughing;—eructations proceeding from the gases evolved in the stomach by its chemical decomposition;—and an excruciating pain in the stomach, such as no natural inflammation can excite. The lips are commonly shrivelled, at first whitish, afterwards, if from *nitric* acid, *yellowish*, and if from *sulphuric* acid, *brownish*. Occasionally there are also excoriations, more rarely little blisters. Similar marks appear on other parts of the skin with which the acid may have come in contact, such as the cheeks, neck, breast or fingers;

and these marks undergo the same change of color as the marks of the lips. The inside of the mouth is also generally shrivelled, white, and often more or less corroded; and as the poisoning advances, the teeth become loose and yellowish—brown about the coronæ. The teeth sometimes become brown in so short a time as three hours. Occasionally the tongue and inside of the cheeks are white, and as it were polished, like ivory. There is almost always great difficulty, and sometimes complete impossibility of swallowing. The matter vomited is generally brownish or black, and causes effervescence on the pavement, if it contain any lime. Afterwards this matter is mixed with shreds of membrane, which resemble the coats of the stomach, and sometimes actually consist of the disorganised coats, but are generally nothing more than coagulated mucus. The bowels are obstinately costive, the urine scanty or suppressed; and the patient is frequently harassed by distressing tenesmus and desire to pass water.—The pulse all along is very weak, and towards the close imperceptible, sometimes intermitting. It is not always frequent: on the contrary, it has been observed of natural frequency, small and feeble in a patient who survived fifteen days. The countenance becomes, at an early period, glazed, and the extremities cold and clammy. The breathing is often laborious, the movements of the chest increasing the pain in the stomach, independently of the pulmonary inflammation which is also at times present. To these symptoms are added occasional fits of suffocation from the shreds of thick mucus sticking in the throat.—Sometimes, however, especially when a large dose has been swallowed, instead of these excruciating tortures, there is a deceitful tranquility and absence of all uneasiness. Occasionally symptoms break out over the body; but their nature has not been described.

81. The *duration* of this variety of poisoning with the acids, is commonly between half a day, and two or three days. But, sometimes life is prolonged for seven or fifteen days; and, sometimes, too, death takes place in a few hours. The shortest duration of any case on record is two hours.

82. The *quantity* required to produce the effects so far mentioned, has not been ascertained.—The smallest fatal dose hitherto recorded, was *one drachm*. A man has recovered after taking *six drachms*.

83. A second variety of symptoms belong to a peculiar modification of disease which brings about a slow death, from an organic disease of the stomach and intestines. It begins with the symptoms already noticed, but these soon abate in violence.—The patient then becomes affected with general fever, dry skin, spasms and pains of the limbs, difficult breathing, tension of the belly, salivation, and occasional vomiting, particularly of food and drink. Afterwards membranous flakes are discharged by vomiting, and the salivation is accompanied with fætor. These flakes are often very

like the mucous membrane of the stomach and intestines; and such they have often been described to be. More probably, however, they are of adventitious formation; for the mere mucous coat of the alimentary canal, cannot supply the vast quantity that is discharged. Sometimes worms are discharged dead, and evidently corroded by the poison. Digestion is at the same time deranged, the whole functions of the body are languid, and the patient falls into a state of marasmus, which reduces him to a mere skeleton, and in the end brings him to the grave—the vomiting of membranous flakes continuing to the last. Death may take place in a fortnight, or not for months. In one case the patient lived eight months.

84. A third variety of symptoms includes cases of imperfect recovery. These are characterised by nothing but the greater mildness of the primary symptoms, and by the patient continuing for life, liable to attacks of pain in the stomach, vomiting of food and general disorder of the digestive functions.

85. In some cases of poisoning with the strong acids, the injury is confined to the gullet and neighboring parts. A case is on record of complete dysphagia from stricture in the gullet, caused by *sulphuric* acid. It appears probable, too, that the strong acids may cause death, without reaching the stomach or even the gullet, by exciting inflammation and spasm of the glottis and larynx.

86. Finally, at least with regard to *sulphuric*

and *nitric* acids, satisfactory evidence of poisoning by them, may alone be occasionally drawn from the following symptoms:—When immediately after swallowing a liquid which causes a sense of burning in the throat, gullet and stomach, violent vomiting ensues, particularly if the vomited matter is mixed with blood;—when the mouth becomes white or yellow, and stripped of its lining membrane, and the cheeks, neck, or neighboring parts show vesications, or white, and subsequently yellow, or brown excoriated spots;—when the clothes show red spots and are disintegrated wherever these appear.

SECT. II.—*Of the Treatment of Poisoning with the Mineral Acids.*

87. Since the mineral acids act entirely as local irritants, it may be inferred that their poisonous effects will be prevented by *neutralizing* them.—But in applying that principle to the treatment, it is necessary to bear in mind their *extremely rapid operation.*

88. Should it be possible to administer *chalk* or *magnesia* without delay, these are the antidotes which ought to be preferred.

89. In the absence of the chalk and magnesia, a substitute may be procured in the *plaster of the apartment*, beat down and made into a thin paste with water.

90. A *solution* of *soap* is another antidote of no small value.

91. While the antidote is in preparation, the acid should be diluted by the free use of any mild fluid, *milk or oleaginous matters being preferred.*

92. The *carbonates of the alkalis* are by no means eligible antidotes, being themselves possessed of corrosive properties.

93. After the proper antidote has been given to a sufficient extent, the use of diluents ought to be continued, as they render the vomiting more easy.

94. The treatment of the supervening inflammation does not differ from that of ordinary cases of inflammation of the stomach.

SECT. III.—*Of the Morbid Appearances caused by the Mineral Acids.*

95. The *outward* appearance of the body in the first variety (81) of the mineral acids is remarkably healthy; every limb is round, firm, and fresh looking.

96. On the *lips*, *fingers*, or other parts of the skin, spots and streaks are found where the acid has disorganized the cuticle. These marks are brownish or yellowish brown, and present after death the appearance of old parchment, or of a burn; sometimes there are little blisters.

97. The *lining membrane of the mouth* is more or less disorganized, generally hardened, whitish or yellowish with *sulphuric acid*, yellowish with *nitric acid.*

98. The *pharynx* is either in the same state as the mouth, or very red. The *rima glottidis* is

sometimes contracted, the *epiglottis* swelled, and the commencement of the *larynx* inflamed.

99. The *gullet* is often lined with a dense yellow membrane, adhering firmly, resembling the inner coat, but probably a morbid formation; and the subjacent tissue is brown or red. Sometimes the whole inner coat of the gullet, as well as that of the throat, epiglottis and mouth, is stripped from the muscular coat. Occasionally the gullet is not affected at all, though both the mouth and the stomach are severely injured; and an instance has even been published where the acid,—the *nitric*,—left no trace of its passage downwards till near the pylorus.

100. The outer surface of the *abdominal viscera* is commonly either very vascular or livid, or bears even more unequivocal signs of inflammation, namely effusion of fibrin and adhesions among the different turns of intestine; and these appearances may take place although the stomach is not perforated. In this respect, poisoning with the acids differs from the effects of most metallic poisons, which very seldom cause unequivocal peritonæal inflammation. The peritonæum, however, has been seen quite natural after death from *sulphuric acid*, even although the stomach was perforated.

101. The *mucous membrane* is not always corroded. If the acid is diluted, the coats may escape corrosion; but there is excessive injection, gorging, and blackness of the vessels, general blackness of the membrane, sometimes even without

softening. More commonly, however, along with the blackness there is softening of the rugæ, or actual removal of the villous coat, occasionally regular granulated ulceration with puriform matter on it.

102. The *stomach* if not ruptured is commonly distended with gases. It contains a quantity of yellowish brown or black matter, and is sometimes lined with a thick paste composed of disorganized tissue, blood and mucus. The pylorus is contracted. The stomach is not always perforated; but, if it is, the holes are circular, and the coats thin at the margin, colored, disintegrated, and surrounded by vascularity and black extravasation. In some rare cases there is no mark of vital reaction, except in the neighborhood of the aperture. The perforation, if the patient lives long enough, is generally accompanied with a copious effusion into the belly of the usual muddy liquor of peritonitis; and the outer surface of the viscera feels unctuous, as if from a slight chemical action of the acid on them. The acid has actually been found in the contents poured out from the stomach into the sac of the peritonæum. But the acid is not always found in the stomach when it is perforated.

103. The *inner coat* of *the duodenum* often presents appearances closely resembling those of the stomach. Sometimes, however, the inner coat of the small intestines is not affected at all.

104. The *urinary bladder* is commonly empty.

105. The *thoracic surface* of *the diaphragm* is

sometimes lined with lymph, indicating inflammation in the chest. In a case which was fatal in two hours, the surface of the *lungs*, as well as that of the *liver* and *spleen*, was observed to be brown and of a leathern consistence, and the tissue beneath scarlet. This appearance has been seen in animals poisoned with *oxalic acid.*

106. The *blood* in the heart and great vessels has been several times seen forming a firm black clot. This state of the blood is not the effect of the particular poison, but its healthy state,* and a striking appearance in contradiction to what is observed after death from most other poisons.

107. The general appearance of the body of those who have died of the chronic variety (83) of poisoning with the acids, is that of extreme emaciation. The *stomach* and *intestines* are excessively contracted, the former has been found so small as to measure only two inches and a half from the cardia to the pylorus, and two inches from the lesser to the greater curvature. The intestines are sometimes no thicker than a writing quill: they are in other respects sound *outwardly*, except that they sometimes adhere together. *Internally*, the pylorus is contracted so as barely to admit a probe. There are spots over the stomach apparently of regenerated villous tissue, smoother and redder than

---

* We understand Dr. Christison to mean by this, that the blood, though black, does not exhibit the *charred* appearance which characterises the condition of that fluid in the vessels after poisoning with the mineral acids.

the natural membrane. At the points where the stomach adheres to the neighboring organs, its coats are sometimes wanting altogether, so that where its connections are torn away, perforations are produced. The other parts of the body are natural.

SECT. IV.—*On Poisoning with Phosphorus and the other Bases of the Mineral Acids.*

108. PHOSPHORUS is no doubt a dangerous poison to animals.* Its effects on *man* have not been often witnessed; but the following observations will show that it is not less injurious to him, than to the lower animals. The subject of the first case to be mentioned, was a stout young man who took a grain and a half in hot water, after having previously taken half a grain without sustaining injury. In seven hours, and not till then, he was attacked with pain in the stomach and bowels, then with incessant vomiting and diarrhœa, excessive tenderness and tension in the belly—all the symptoms in short of irritant poisoning; and he died exhausted in twelve days. A second fatal case somewhat similar in its circumstances, is that of an apothecary, who, after taking in one day first a single grain

---

* It appears from the experiments of Magendie and Orfila, that phosphorus acts as an irritant poison, only by combining with the oxygen of the air contained in the alimentary canal, thus giving rise to the formation of phosphorous or phosphoric acid; hence, this change is hastened when the phosphorus has been previously divided in oil, or is retarded in proportion as the stomach contains a greater quantity of food.

and then two grains without experiencing any particular effects, swallowed next day three grains at once in syrup. In the evening he felt generally uneasy, from a sense of pressure in the belly, which continued for three days; and then he was also seized with violent, continual vomiting of matter which had an alliaceous odor. On the seventh day he had also spasms, delirium, and palsy of the left hand; and death speedily ensued. In a third case on record, death took place in forty hours, and the symptoms were violent pain in the stomach, and continual vomiting, together with the discharge by clysters of small fragments of phosphorous, which were discovered by their shining in the dark, and subsequently by the appearance of burnt spots on the bed linen.*

109. As to the *morbid appearances* caused by poisoning with phosphorus, the same changes of structure may be expected as in the instance of the mineral acids generally. In the first quoted above (108) the skin was generally yellow, and here and there livid; the lungs gorged with blood; the mus-

---

* *Treatment of Poisoning with Phosphorus.*—The most pressing indication, when the phosphorus has been swallowed in a solid state, is to administer an emetic, with a view of throwing up the poison before it has had time to become acidified. But if it has been taken in a state of great division, it will then be advantageous to administer copious draughts containing calcined magnesia in suspension, for the purpose of expelling the atmospheric air from the stomach, and likewise neutralizing any phosphoric acid that may have been formed.

cular coat of the stomach inflamed, but the other coats not, except near the two extremities of the organ, where they were black. In the third case likewise, quoted above, (108,) much fluid blood was discharged from the first incisions through the skin of the belly; the *omentum* and *outside* of the *stomach* and *intestines* were red; the *villous coat* of the stomach presented an appearance of gangrenous inflammation, (probably black extravasion only;*) the inner membrane of the *duodenum* was similarly affected; the *great intestines* were contracted to the size of the little finger; the *mesenteric glands* enlarged; and the *kidneys* and *spleen* inflamed.

110. SULPHUR, which resembles the phosphorus in many particulars, does not bear any resemblance to it in physiological properties. It certainly possesses, however, slightly irritative properties. The veterinary school at Lyons, found that a pound killed horses by producing violent inflammation, recognizable during life by the symptoms, and after death by the morbid appearances.

111. CHLORINE in its *gaseous* state acts powerfully as an irritant on the windpipe and lungs, and will be noticed under the head of the poisonous gases (155.) In *solution* it retains to a certain degree its poisonous qualities. Five ounces of a strong solution killed a dog in twenty-four hours,

---

* Dr. Christison's remark upon the case as originally reported.

when kept in the stomach by a ligature. Two ounces with twice its volume of water proved fatal in four days. The symptoms were those of irritation of the stomach, accompanied in the former case, with general redness and blackness, and, in the latter, with ulceration of its villous coat.

SECT. V.—*On Poisoning with Iodine and Bromine and their compounds.*

112. IODINE has a two-fold action, one local and irritating, the other general, and produced only when it has been administered long in frequent small doses.

113. With regard to the *violent* action of iodine on man, *Orfila* found that four or six grains taken by himself produced a sense of constriction in the throat, sickness, pain in the stomach, and at length vomiting and colic. A case is mentioned, in which an over dose produced violent pain in the belly, vomiting, profuse bloody diarrhœa, coldness and blanching of the skin, rigors, quivering of the sight and rapid pulse. In a third case, two drachms and a half of iodine were swallowed for the purpose of self-destruction. A sense of dryness and burning from the throat down to the stomach was immediately produced; lacerating pain in the stomach and fruitless efforts to vomit succeeded; and in an hour, when the relater of the case first saw the patient, there was suffusion of

the eyes, excessive pain and tenderness of the epigastrium, and sinking of the pulse.*

114. *In medicinal doses*, such as a quarter of a grain, frequently repeated, it is a dangerous poison, unless its effects are carefully watched. For in consequence of absorption and accumulation in the system, it produces when long used some very singular and hazardous symptoms; and like mercury, foxglove, and some other poisons, it may remain in the body for a considerable period inactive, and at length begin to operate suddenly. The symptoms which it then occasions are sometimes those of irritation, namely, incessant vomiting and purging, acute pain in the stomach, loaded tongue, rapid and extreme emaciation, violent cramps and small frequent pulse. These symptoms may continue many days, and even when subdued to a certain extent, vomiting and cramps are apt to recur for months after.

115. Among the leading effects of iodine, when slowly accumulated in the body, the following have been summarily specified,—absorption of the fat; increase of all the excretions; dinginess of the skin, with frequent clammy sweat; hurried anxious breathing; diuresis and an appearance of oil

---

* *Treatment of Poisoning by Iodine*—No definite mode of treatment for poisoning by iodine being given by *Dr. Christison*, it may be mentioned to that effect, that in the third case adduced above, "vomiting was brought on by warm water; copious yellow discharges, possessing the smell and taste of iodine, took place; and in nine hours the patient was well."

floating in the urine; increased discharge of fæces, which are unusually bilious, but free of mucus; increased secretion of semen; increased menstrual discharge; swelling of the subcutaneous veins, and lividity of the lips; feebleness of the pulse, with superabundance of serosity in the blood; impaired digestion and diminished secretion of saliva and mucus. The affection thus induced has been termed *Iodism.*

116. The *morbid* appearances left from slow poisoning with iodine have been stated as follows: enlarged abdomen from distention of the intestines with gases, enlargement of the other viscera and serous effusion into the peritonæum; adhesion of the viscera to one another; redness of the intestines, in some places, approaching to gangrenous discoloration; redness and excoriation of the peritonæal coat of the stomach, and also of its villous coat; enlargement and pale rose-red coloration of the liver. In the chest, serum was found in the sac of the pleura. The gullet was contracted in diameter and red internally.

117. HYDRIODATE OF POTASSA seems to be in large doses an irritant, though not a powerful one. Two drachms in an ounce of water killed a dog in three days with violent vomiting, and signs of irritation were found in the stomach, namely, black extravasated spots and ulcers in the middle of them. A solution injected into the cellular tissue caused only local inflammation. Injected into the

jugular vein in the dose of four grains, it produced tetanus and death in a minute and a half.

118. Bromine is also an active poison; and so far as may be judged from what is hitherto known, it is a pure local irritant. It appears to act most energetically when most thoroughly dissolved in water.

119. Hydrobromate of potassa in the dose of half a drachm in solution, produces dullness and depression in dogs, but no other bad effect.—Two drachms retained in the stomach by tying the gullet occasioned death in three days with symptoms of irritant poisoning.

Sect. VI.—*On Poisoning with Oxalic Acid.*

1. *On the action of Oxalic Acid, and the pathological symptoms it causes in Man.*

120. The action of this acid on the animal economy is very peculiar. When not sufficiently concentrated to occasion death by the local injury produced, it is supposed to act on the nervous system through the medium of the blood.

121. In its *concentrated* state, when injected into the stomach of a dog or cat, it causes exquisite pain, expressed by cries and struggling. In a few minutes this is succeeded by violent efforts to vomit; then by sudden dullness, languor, and great debility; and death soon takes place without a struggle. The period which elapses before death, varies from two to twenty minutes, when the dose is considerable—half an ounce, for example. Af-

ter death the stomach is found to contain black extravasated blood, exactly like blood acted on by the acid out of the body; the inner coat of the stomach is of a cherry-red color, with streaks of black granular warty extravasation; and, in some places, the surface of the coat is very brittle, and the subjacent stratum gelatinized, evidently by the chemical action of the poison. If the stomach is examined immediately after death, little corrosion will be found, compared with what is seen if the inspection be delayed a day or two.

122. In its *diluted* state, at least when considerably diluted, the phenomena of poisoning with oxalic acid are totally different. When dissolved in twenty parts of water, like the mineral acids in the same circumstances, it ceases to corrode; nay, it hardly even irritates. But, unlike them, it continues a deadly poison; for it causes death by acting indirectly on the brain, spine and heart. The symptoms then induced, vary with the dose. When the quantity is large, the most prominent symptoms are those of palsy of the heart; and, immediately after death that organ is found to have lost its contractility, and to contain arterial blood in its left cavities. When the dose is less, the animal perishes after several fits of violent tetanus, which affects the respiratory muscles of the chest in particular, causing spasmodic fixing of the chest and consequent suffocation. When the dose is still less the spasms are slight or altogether wanting, and death occurs under symptoms of pure narco-

tism, like those caused by opium; the animal appears to sleep away.

123. To whatever *texture of the body* oxalic acid be applied, it acts with violence, and produces nearly the same effects. It causes death with great rapidity when injected into the sac of the peritonæum, or into that of the pleura; it acts with still greater quickness when injected into a vein; and it also acts when injected into the cellular tissue beneath the skin, but with much less celerity than through any other channel. The symptoms are nearly the same in every case.

124. In *man* the most prominent symptoms hitherto observed have been those of excessive irritation, because it has been almost always swallowed in a large dose and much concentrated.

125. Oxalic acid is the most rapid and unerring of all the common poisons. Few of those who have died after taking it, survived above *an hour*. This rule, however, is by no means without exception. A case has been described which did not prove fatal before *thirteen* hours. Another is mentioned, in which, after the patient seemed to be doing tolerably well, an exhausting fever, with dyspepsia and singultus, carried him off in *twenty three days*.

126. The *smallest* dose, among the fatal cases, has been half an ounce; but there can be little doubt that less would be sufficient to cause death.

127. Very few persons have recovered, when the quantity was considerable.

128. In every instance in which the dose was considerable, and the solution concentrated, the first symptoms have been immediate burning pain in the *stomach*, and generally also in the *throat*.—But when the dose was small, more particularly if the solution was also rather diluted, the pain has sometimes been slight, or slow in commencing.—A patient, who took only half an ounce, dissolved in ten parts of water, and diluted it immediately after with copious draughts of water, had not any pain in the belly for six hours.

129. In general, violent vomiting follows the accession of pain, either immediately, or in a few minutes; and it commonly continues till near death. Some, however, have not vomited at all, even when the acid was strong and in a large dose; and this is still more apt to happen when the poison has been taken much diluted. The patient last mentioned (128) did not vomit at all for seven hours, except when emetics were administered. The vomited matter is sometimes *bloody*.

130. Instant discharge of the poison by vomiting does not always save the patient's life. A woman who swallowed two ounces died in twenty minutes, although she vomited almost immediately after taking the poison.

131. The *tongue* and *mouth* occasionally become inflamed, if the case last long enough. In an instance of recovery, the tongue was red, swollen, tense, and tender, the day after the acid was swallowed.

132. Death commonly takes place so soon, that the bowels are seldom much affected. But when life is prolonged a few hours, they are evidently much irritated. A patient who lived thirteen hours, had severe pains in the bowels and frequent inclination to go to stool, and the patient (128) who also lived the same time, had a constant involuntary discharge of fluid fæces, occasionally mixed with blood.

133. The signs of *depressed circulation* are always very striking. In general, the pulse fails altogether, it is always very feeble, and the skin is cold and clammy.

134. In some cases *nervous symptoms* have occurred, but in none so distinctly as in animals that have taken the diluted acid. These signs are to be looked for chiefly when the case is lingering, and the symptoms of irritation slight and late in appearing. Convulsions appear to have occurred in some instances either at the time of death or a short period before it.

135. Finally—oxalic acid is one of the poisons, of whose operation distinct evidence may sometimes (though certainly not always) be found in the symptoms. If a person, immediately after swallowing a solution of a *crystalline* salt, which tasted purely and strongly acid, is attacked with burning in the *throat*, then with burning in the *stomach*, vomiting, particularly of *bloody matter*, *imperceptible pulse*, and excessive *languor*, and dies in half an hour, or still more in twenty, fif-

teen, or ten minutes, no fallacy is known which can interfere with the conclusion, that *oxalic acid* has been the cause of death. No parallel disease begins so abruptly and terminates so soon; and no other crystalline poison has the same effects.

2. *Of the Treatment of Poisoning with Oxalic Acid.*

136. The principal object of the practitioner should be to administer *as speedily as possible* large doses of *chalk* or *magnesia* suspended in water.

137. As no time should be lost, the *plaster of the apartment* should be resorted to, when chalk or magnesia is not at hand.

138. Emetics may be given, if vomiting is not already free; but *time should never be lost* in administering them if an antidote is at hand.

139. *In particular* it is necessary to avoid giving warm water with a view to accelerate vomiting; for dilution will promote the entrance of the poison into the blood, if it has not the effect of immediately expelling it.

140. Alkalis which were once used as antidotes are *inadmissible*, because, as they form only soluble salts, they will not deprive oxalic acid of its remote or indirect action (23.)

3. *Of the Morbid Appearances caused by Oxalic Acid.*

141. The *external* appearance of the body is commonly natural.

142. In one instance the *cellular tissue* was distended with gases ten hours after death.

143. The mucous coat of the *throat* and *gullet*, in the case which has been last described, looked as if it had been scalded, and that of the gullet could be easily scratched off. The lining membrane of the *windpipe* was very red. In another case, (128,) the inner membrane of the gullet was removed, so that the muscular coat was exposed; and this coat presented a dark gangrenous-like appearance, being much thickened and highly injected.

144. Violent marks of irritation have been commonly found in the *stomach*. In one case, the stomach contained a pint of thick fluid. (This fluid is commonly dark, like coffee-grounds.) The *inner* coat was pulpy, in many points black, in others red. The *outer* coat was inflamed. In the patient (128) the whole villous coat of the stomach was either softened or removed. Some cases have occurred, however, in which the stomach was quite healthy.

145. The inner membrane of the *intestines* was similarly, but less violently affected than the stomach. But in the case of a girl who died thirty minutes after swallowing an ounce of acid, no morbid appearance, whatsoever, was to be seen in any part of the alimentary canal.

146. In several instances the *blood* in the veins of the stomach is described as having been black and as it were charred.

SECT. VII.—*On Poisoning with Acetic Acid.*

147. Acetic acid exists in various forms. The most common is ordinary *vinegar*, in which it is much diluted. Another common form is the *pyroligneous* vinegar, *pyroligneoùs acid*, or *pyroligneous acetic acid*, as it is variously called. A third form is the concentrated or *pure acetic acid* of the apothecary, which is familiarly known as the chief ingredient and menstruum of a common perfume, the *aromatic vinegar*.

148. All these forms of acetic acid have proved fatal to dogs when given in sufficient quantity, and prevented from being discharged by vomiting. An ounce of pyroligneous vinegar, administered to dogs of middle size, and retained in the stomach by a ligature on the gullet, produces efforts to vomit, evident suffering, prostration of strength, and death in five, seven, or nine hours. An ounce of concentrated acetic acid occasioned death in one hour and a quarter; and four or five ounces of common vinegar proved fatal in ten or fifteen hours.

149. In these experiments distinct evidence was procured in the dead body of the irritant action of the poison. The stomach contained brownish black blood, the villous coat was blackish, and the subjacent cellular tissue injected with black blood; sometimes there was an appearance of erosion on the surface of the villous coat; and in the instance of the concentrated acid perforations were found.

150. It has been stated, that a small quantity of acetic acid dropped into the *windpipe*, produced hissing respiration, rattling in the throat, and death in three days from true croup. A *post mortem* examination showed the lining membrane of the windpipe to be covered with a fibrinous pseudo-membrane, exactly as after croup.

151. Finally, the *concentrated* acid is a powerful irritant, and even corrosive when applied externally; which properties are owing to its power of dissolving many of the soft animal solids.

CHAPTER VI.

CLASS FIRST—ORDER SECOND.

OF POISONING WITH THE IRRITANT GASES.*

152. THE *irritant gases* are, *nitric oxide gas* and *nitrous acid vapor*, *hydro-chloric acid gas*, *chlorine*, *ammoniacal gas*, and *sulphurous acid.*

1. *Of Nitric Oxide Gas and Nitrous Acid Vapor.*

153. Before nitric oxide gas can be breathed in ordinary circumstances, it is transformed by the oxygen of the air into nitrous acid vapor, of a ruddy color and irritating odor. In animals killed by inhaling this vapor, the *windpipe* was found much inflamed. In the case of a chemical manufacturer who breathed the fumes for some time, the patient was seized in four hours with symptoms of inflammation in the *throat* and *stomach.* At night the urine was suppressed; the skin afterwards became blue; at last he was seized with hiccup, acute pain in the diaphragm, convulsions and delirium;

---

* Dr. Christison has himself suggested the propriety of considering the irritant gases in this place, although he has found it more convenient to treat of all the poisonous gases under one head. The usefulness of a *manual* is, we think, greatly enhanced, by as strict an adherence to the classical arrangement, which has been adopted, as possible.

and he died twenty-seven hours after the accident. Another case proved fatal in two days, and the symptoms were those of violent pneumonia. In this instance there was peripneumony of one side, and pleurisy of the other; the uvula and throat were gangrenous, and the windpipe and air-tubes dark red; the veins throughout the whole body were much congested, the skin very livid in many places, and the blood, fluid in the heart, but coagulated in the vessels. Two more cases of death from the same cause have occurred in hatters.—They had incautiously exposed themselves too much to the fumes, which are disengaged during the preparation of nitrate of mercury for the felting of the furs, and which are well known to be nitric oxide gas converted into nitrous acid vapor by the contact of the air. Two men died of inflammation of the lungs excited in that manner; and a third, a boy of fourteen, after sleeping all night in an apartment where the mixture was effervescing, was attacked in the morning with yellowness of the skin, giddiness, and colic, which ended fatally in six days.*

---

* In *Mr. Broughton's* experiments, the blood appeared to have lost much of its arterial character, the right ventricle was distended, and the vessels of the brain and lungs were collapsed.

The nitrous acid vapor, according to Mr. B. seems to act directly upon the centre of the nervous system, while it appears also to suspend the contractility of the involuntary organs of motion.—*Jour. of the R. Institution, Jan. to June,* 1830.

2. *Of Hydro-chloric Acid Gas.*

154. Hydro-chloric acid gas will no doubt act on man as a violent and pure irritant. It is exceedingly hurtful to vegetable life.*

3. *Of Chlorine.*

155. The well known irritating effects of chlorine, when inhaled in the minutest quantities, show that it will produce inflammation of the lungs and air passages. At the same time, how irritating soever it may be to an unaccustomed person, yet by the force of habit, one may breathe without injury an atmosphere much loaded with it.† The chief consequences of habitual exposure are acidity and other stomach complaints, which can be generally corrected by taking chalk.‡

---

* Hydro-chloric or muriatic acid gas is certainly a violent irritant. It cannot, indeed, be readily drawn into the lungs, the glottis being usually spasmodically closed whenever an attempt is made to inspire the gas; but when breathed, it produces irritation of the mucous membrane, and spitting of blood. Any slight incommodity arising from inhaling this gas may be removed by weak aqua ammoniæ passed frequently under the nose.

† Its effects in an atmosphere overcharged with it are readily neutralized by the disengagement of sulphuretted hydrogen gas.

‡ In *Mr. Broughton's* experiments, several mice exposed to this gas, fell dead in less than thirty seconds. On opening these animals, the heart was found palpitating in each, and the peristaltic motion of the intestinal canal continued, and was kept up by irritating it with a probe. The vessels of

4. *Of Ammoniacal Gas.*

156. Ammonia, when in the state of gas, acts violently as an irritant on the mouth, windpipe, and lungs. *(The reader is referred for a fuller account of its effects to the section on ammonia and its salts.)*

5. *Of Sulphurous Acid Gas.*

157. Sulphurous acid gas is exceedingly deleterious to vegetable life, being hardly inferior in

---

the brain were collapsed. *The lungs were tinged with the yellow color of the gas, and the peculiar odor of chlorine was perceptible throughout their structure.* Coagulation took place as usual under ordinary circumstances. A rabbit, two or three weeks old, was immersed in chlorine, and it died in less than half a minute. On opening the thorax the heart was found acting freely, and on puncturing the aorta the blood jetted forcibly out to a considerable distance. The peristaltic motion of the bowels was also going on. The vessels of the brain were in a collapsed state. *The lungs were very much distended, and they were tinged with yellow; and when removed from the chest to a distance, they emitted the odor of chlorine.* The right ventricle of the heart was distended with dark blood. The eyes were much glazed in each experiment. "It has generally been thought," adds Mr. B. "that chlorine is incapable of passing the epiglottis; but from the above observations it is evident that this gas enters the bronchial tubes in the act of inspiration. A portion of it probably circulates through the brain, suspending the cerebral functions without directly destroying the action of the involuntary organs, contractility remaining long after the destruction of animal life, as is evinced by the activity of the heart and of the intestinal canal."—*I. of the R. I. ubi supra.*

that respect to hydro-chloric acid gas. It will, without a doubt, prove a powerful irritant.*

---

* Orfila says, that, according to M. Hallé, sulphurous acid gas kills guinea-pigs who inhale it, in less than a minute and a quarter; its effects depending on the irritation produced in the lungs. In this neighborhood, where there are several chambers for the manufacture of oil of vitriol, it has not been known to produce any injurious effects upon the workmen.—Should any accident happen, it is recommended to respire cautiously some aqua ammoniæ, which may also be administered in a dose of from five to six drops in a glass of sugar and water.

CHAPTER VII.

Class First—Order Third.

158. The third order of the first class of poisons may be conveniently divided into two groups—the first embracing the two fixed alkalis, *potassa* and *soda*, with their *carbonates* and *nitrates*, and also *lime;* the second group embracing *ammonia*, with its *salts*, and likewise the *alkaline sulphurets*.

Group First.

OF THE ALKALIS AND ALKALINE SALTS.

159. The action of the poisons belonging to the first group is purely irritant and strictly local.

160. When *concentrated*, the *fixed alkalis* and their *carbonates*, produce chemical decomposition, softening the animal tissues, and reducing them eventually to a pulpy mass; which change depends on their possessing the power, as chemical agents, of dissolving almost all the soft solids of the body.

161. When much *diluted*, the *fixed alkalis* and their *carbonates* produce inflammation, without corroding the textures; and it does not appear that they are even then absorbed in such quantity as to prove injurious to any remote organ.

162. The action of the *alkaline nitrates* and of *lime* is that of irritants only; at least their chemical action is obscure and feeble.

SECT. I. *Of the Fixed Alkalis and their Carbonates.*

1. *Of the action of the Fixed Alkalis, and the Pathological Symptoms they cause in Man.*

163. The action of the two fixed alkalis, *potassa* and *soda*, and their carbonates, on the animal system is so nearly the same, that the facts which have been ascertained in respect to one of them will apply to all the rest.

164. When *caustic potassa* is injected in minute portions into the *veins*, it instantly coagulates the blood. Five grains will in this way kill a dog in two minutes.

165. When introduced into the *stomach*, it acts powerfully as an irritant, and generally corrodes the coats of that organ. Thirty-two grains given to a dog caused pain in the *gullet*, violent vomiting, much anguish, restlessness, and death on the third day. It has been observed that when the gullet was defended, by the potassa being passed at once into the stomach in a caustic-holder, larger doses, even several times repeated, did not prove fatal. The usual violent symptoms of irritation prevailed for two or three days; but on these subsiding, the animals rapidly recovered their appetite and playfulness, appearing in fact to be restored to perfect health. Yet there could be no doubt that the stomach all the while was severely injured; for in some of the animals, which were strangled for the

sake of examination several weeks after they took the poison, the villous coat was found extensively removed, and even the muscular and peritonæal coats were here and there destroyed and cicatrized. It is further added, that ten or fifteen grains introduced into the *rectum* caused death sooner than three times as much given by the mouth.

166. The *carbonate of potassa* possesses properties similar in kind to the caustic potassa, but inferior in degree. Two drachms given to a dog killed it in twenty-five minutes, violent vomiting and great agony having preceded death. The stomach was universally of a deep red color on its inner surface.

167. In *man*, the symptoms are, in the first instance, an acrid burning taste, and rapid destruction of the lining membrane of the *mouth;* then burning, and often constriction in the *throat* and *gullet*, with difficult and painful deglutition; violent vomiting, often sanguinolent, and tinging vegetable blues green; next acute pain in the stomach and tenderness of the whole belly; subsequently cold sweats, excessive weakness, hiccup, tremors and twitches of the extremities; and ere long violent colic pains, with purging of bloody stools and dark membranous flakes. So far the symptoms are nearly the same in all cases; but in their subsequent course several varieties may be noticed.

168. In the *worst form* of poisoning with the carbonates of the fixed alkalis, death ensues at an

early period, for example, within twenty-four hours, nay, even before time enough has elapsed for diarrhœa to begin.

169. In the *mildest form*, the symptoms represent pretty nearly an attack of acute gastritis when followed by recovery. The effects on man are then analagous to those observed when the poison was introduced into the stomach without touching the gullet. (165.)

170. *A much more common form* than either of the preceding, is one similar to the chronic form of poisoning with the mineral acids, in which constant vomiting of food and drink, incessant discharge of fluid, sanguinolent stools, difficulty of swallowing, burning pain from the mouth to the anus, and rapid emaciation, continue for weeks or even months before the patient's strength is exhausted; and when death is evidently owing to starvation, the alimentary canal being no longer capable of assimilating food. In one characteristic case of this kind, at the end of the sixth week, the membrane of the mouth was regenerated; but the gullet continued to discharge pus, and the stools were purulent and bloody.

171. *Another form*, perhaps equally common with that just described, and not less certainly fatal, commences like the rest with violent symptoms of irritation in the mouth, gullet, and stomach; but the bowels are not affected, and by and by it becomes apparent that the stomach is also ittle injured; dysphagia, or even complete ina-

bility to swallow, burning pain and constriction in the gullet, hawking and coughing of tough, leathery flakes, are then the leading symptoms; at length the case becomes one of stricture of the œsophagus, with or without ulceration; the bougie gives only temporary relief, and the patient eventually expires either of mere starvation, or of this combined with an exhausting fever.

2. *Of the Treatment of Poisoning with the Fixed Alkalis.*

172. In the treatment of poisoning with the alkalis, the first object is evidently to neutralize the poison. This may be done either with oil, or with a weak acid.

173. The *best* antidote for the mineral alkalis and their carbonates, appears to be a *fixed oil,* such as *almond oil,*[*] which acts partly by rendering the vomiting free and easy, partly by converting the alkali into soap. It must be given in *large quantity, several pounds* being commonly required.

174. Of the acids, the acetic in the form of vinegar is most generally recommended, as it is not itself injurious.

3. *Of the Morbid Appearances caused by the Fixed Alkalis.*

175. The morbid appearances caused by potassa, soda, and their carbonates, differ with the nature of the case.

---

[*] It is evident that *olive oil,* which is more commonly at hand, must answer the same purpose.

176. In the case of a boy who died in twelve hours, the *inner* membrane of the *throat* and *gullet* was found almost entirely disorganized and reduced to a pulp, with blood extravasated between it and the muscular coat. The inner coat of the stomach was red, in two round patches destroyed, and the patches covered with a clot of blood; its outer coat, as well as all the other abdominal viscera, was sound.

177. In two *chronic* cases (170) the mischief was more general, the whole *peritonæum* being condensed, the *omentum* dark and turgid, the *intestines* glued together by lymph, the *external* coats of the *stomach* thick, the *villous* coat almost all destroyed, what remained of it and near the pylorus ulcerated, the *pyloric orifice* of the stomach plugged up with lymph so as barely to admit a small probe.

178. In a patient who died of stricture of the gullet (171) the *intestines* were sound, the inner surface of the *stomach* red, especially towards the cardia, the inner and muscular coats of the *gullet* thickened, and firmly incorporated together by effused lymph, the inner coat here and there wanting, the passage of the gullet every where contracted, and to such a degree about two inches above the cardia as hardly to pass a common probe.

SECT. II.—*Of the Alkaline Nitrates, and of Lime.*

179. The NITRATE OF POTASSA, [nitre, saltpetre, sal-prunella,] is the more important of the

two salts to be examined in this section. It is a dangerous poison. It has been often mistaken for the saline laxatives, especially for the sulphate of soda, and has thus been the source of fatal accidents.

1. *Of the Action of Nitrate of Potassa and its Pathological Symptoms in Man.*

180. *Nitrate of potassa* forms an exception to the general law laid down (23) with regard to the effect of chemical neutralization on the pure local irritants. Both its acid and its alkali are simple irritants; yet the compound salt, though certainly much inferior in power, is still very energetic.—Nay, experiments tend even to prove that the action of its alkali and acid is materially altered in kind by their combination with one another; for besides inflaming the part to which it is applied, *nitre* has at times produced symptoms of a secondary disorder of the brain and nerves.

181. On animals, nitre appears to have a twofold action, the one irritating, the other narcotic.—An ounce and a half killed a dog in ninety minutes when the gullet was tied, and a drachm another in twenty-nine hours. Death was preceded by giddiness, slight convulsions, dilated pupil, insensibility and palsy. After death the stomach was externally livid, internally reddish-black, and the heart filled in its left cavities with florid blood; when the gullet was not tied, the animals recovered after several attacks of vomiting,

and general indisposition for twenty-four hours; and where the salt was applied externally to a wound, it excited violent inflammation, passing on to gangrene, but without any symptoms which indicated a remote or indirect operation.

182. As to its effects on *man*, it must first be observed, that *considerable doses* are necessary to cause serious mischief. In the quantity of one, two or three scruples, it is often given medicinally several times a day without injury to the patient. An ounce and a half, largely diluted, has been thus safely administered in the course of twenty-four hours. Sometimes, too, even large single doses have been swallowed with impunity. A gentleman once took nearly an ounce by mistake for Glauber's salt, and retained it above a quarter of an hour; nevertheless, except several attacks of vomiting, no unpleasant symptom was induced.—Another instance is related in which *two ounces* were retained altogether, and caused only moderate griping, with considerable purging and flow of urine. *In general, however,* it must be considered a dangerous and rapid poison in the dose of *an ounce.*

183. In the quantity of *a drachm* or *a drachm and a half*, recently dissolved in four ounces of water, and repeated every ninety minutes, it was found that the third or fourth dose caused chilliness and stinging pains in the stomach, and over the whole body; and these sensations became so severe with the fourth dose, that it was considered

unsafe to attempt a fifth. Two cases which were actually fatal have been described, the one caused by *one ounce*, the other by *an ounce and a half.*—In the latter, the symptoms were those of the most violent cholera, and the patient died in two days and a half; in the former, death took place in *three hours* only, and in addition to the symptoms remarked in the other, there were convulsions and twisting of the mouth. In both, the *pulse* failed at the wrist, and a great tendency to fainting prevailed for some time before death. Similar effects have been remarked in several cases which have been followed by recovery.

184. As regards the secondary operation on the nervous system of poisoning by nitre, this kind of action is strongly pointed out by the particulars of a case, in which the only disorder produced appeared to depend on derangement of the cerebral functions. A woman, after swallowing an *ounce* of nitre, instead of Glauber's salt, lost the use of speech and the power of voluntary motion, then became insensible, and was attacked with tetanic spasms. This state lasted till next day, when some amelioration was procured by copious sweating. It was not, however, till eight days after, that she recovered her speech, or the entire use of her mental faculties; and the palsy of the limbs continued two months.*

---

* *Treatment of Poisoning with the Nitrate of Potassa.*—It consists in the administration of mucilaginous and demulcent drinks; opium to allay pain and irritation, and cordials in the sinking condition of the system.

2. *Of the Morbid Appearances caused by Nitrate of Potassa.*

185. The morbid appearances observed in *man* are solely those of violent inflammation of the stomach and intestines. In the case, which proved fatal in three hours (183) the *stomach* was distended, and the *contents* deeply tinged with blood; its *peritonæal* coat of a dark red color, mottled with black spots; its *villous* coat very much inflamed and detached in several places. The liquid contents gave satisfactory evidence of nitre having been swallowed; for a portion evaporated to dryness deflagrated with burning charcoal. In the other patient, who lived sixty hours, the stomach was every where red, in many places checkered with black spots, and at the centre of one of these spots the stomach was perforated by a small aperture. The whole intestinal canal was also red.

3. *Of the Action of Nitrate of Soda.*

186.*

4. *Of the Action of Lime.*

187. The action of lime is purely irritant. *A drachm and a half* of unslaked lime, given to a little dog, caused vomiting and slight suffering for a day only; *three drachms* killed the same animal

---

* Nitrate of soda having been lately extensively introduced into commerce, and mistaken for salt-petre, it may be proper to remark of it here, that it will most probably be found to produce the same effects on the animal system, as the nitrate of potassa.

in five days, vomiting, languor, and whining being the only symptoms, and redness of the throat, gullet, and stomach, the only morbid appearances.

188. In the *human subject*, though a feeble poison, it has nevertheless proved fatal. A case is on record of a boy who swallowed some lime in an apple-pie, and died in nine days, affected with thirst, burning in the mouth, burning pain in the belly, and obstinate constipation. Another case is that of a young woman, afflicted with pica or depraved appetite, who took to the eating of quick lime; and in consequence she was attacked with pain and gnawing in the belly, sore throat, dryness of the mouth, insatiable thirst, difficult breathing and cough; but she recovered.

189. It is well known that quick-lime also inflames the skin or even destroys its texture, apparently by withdrawing the water which forms a component part of all soft animal tissues. When thrown into the eyes it causes acute and obstinate opthalmia, which may end in loss of sight.*

Group Second.

OF AMMONIA, WITH ITS SALTS, AND THE ALKALINE SULPHURETS.

190. The second group of the order of alkaline poisons, including ammonia with its salts, and the sulphuret of potassa, have a double action on the

---

* *Treatment of Poisoning with Lime.*—See, treatment of poisoning with the fixed alkalis, page 84.

system, analagous to that possessed by many metallic poisons. They are powerful irritants; but they produce besides, through the medium of the blood, a disorder of some part of the nervous system, and their remote is sometimes more dangerous than their local action. The nervous affection produced by ammonia, and the sulphuret of potassa, closely resembles tetanus, and therefore depends probably on irritation of the spinal column.

Sect. I.—*Of Ammonia and the Ammoniacal Salts.*

191. Ammonia is when pure a gaseous body; but as commonly seen, it exists in solution in water, which dissolves it in large quantity. The *salts* of ammonia usually met in commerce are, the *sesqui-carbonate*, [sub-carbonate—smelling salt—volatile salt—salt of hartshorn,] and the *muriate of ammonia*, [sal ammoniac.]

1. *Of the Action of Ammonia and the Ammoniacal Salts, and their Pathological Effects on Man.*

192. To determine the action of ammonia on he animal system, sixty grains of the pure soluion were injected into the jugular vein of a dog. mmediately the whole legs were spasmodically xtended; at times convulsions occurred; and in en minutes it died. The chest being laid open intantly, coagulated florid blood was seen in the *left* entricle, and *black* fluid blood in the *right* ventrile of the heart. No morbid appearance was disernible any where else except complete exhaus-

tion of the muscular irritability. Half a drachm of a strong solution was introduced into the *stomach* of another dog and the gullet tied. The animal was at first much agitated; but in five minutes became still and soporose; after five hours it continued able to walk; in twenty hours it was found quite comatose; and death ensued in four hours more. The only morbid appearance was slight mottled redness of the *villous* coat of the stomach. A third dog, to which two drachms and a half of common *carbonate* were given in fine powder, died in twelve minutes. First, it vomited; next, it became slightly convulsed; and the convulsions gradually increased in strength and frequency till the whole body was agitated with dreadful spasms; then the limbs became rigid, the body and head were bent backwards, and in this state it expired, apparently suffocated in a fit of tetanus.

193. In the *human subject*, several cases of poisoning with ammonia or its carbonate have occurred. A case is mentioned which proved fatal in *four minutes*, and which was caused by a small bottleful of ammonia having been poured into the mouth of a man who had been bitten by a mad-dog. From the rapidity of the poisoning, it is probable that a nervous affection must have been induced. More generally, however, the effects are simply irritant; and the seat of the irritation will vary with the mode in which the poison is given.*

---

* *Treatment of Poisoning with Aqua Ammonia.*—Vinegar, which acts by neutralizing the ammonia, is the best antidote

194. If it is *swallowed*, the *stomach* and *intestines* will suffer; if it is imprudently *inhaled* in too great quantity, *inflammation* of the lining membrane of the *nostrils* and *air-passages* will ensue.

195. A very interesting example of the *first* mode of affection has been related, as it occurred in a young man, who had acquired a strange habit of chewing the solid carbonate of ammonia of the shops. He was seized with great hemorrhage from the nose, gums, and intestines; his teeth dropped out; wasting and hectic fever ensued; and although he was at length prevailed on to abandon the pernicious habit, he died of extreme exhaustion, after lingering several months. A very striking instance of *bronchial inflammation*, arising from an imprudent and excessive application of ammonia, as a stimulant to the nostrils, has likewise been related. A medical man, liable to epilepsy, was found in a fit by his servant, who ignorantly tried to rouse him by holding to his nostrils a handkerchief dipped in ammonia. In this way about two drachms appear to have been consumed. On recovering his senses, the patient complained of burning pain from the mouth downwards to the stomach, great difficulty in swallowing, difficult breathing, hard cough, and copious expectoration, profuse mucous discharge from the nostrils, and excoriation

---

to an overdose of the water of ammonia; but as this alkali exerts its action on the nervous system with great celerity, the antidote must be promptly administered. The subsequent inflammation is to be treated on general principles.

of the tongue. The bronchitis increased steadily, and carried him off in the course of the third day, without convulsions or any mental disorder having supervened. Another case has been recorded of analogous effects produced by the incautious use of ammonia as an antidote for prussic acid. The patient had all the symptoms of a violent bronchitis, accompanied with redness and scattered ulceration of the mouth and throat; but he recovered in thirteen days.

2. *Of the Morbid Appearances caused by poisoning with Ammonia.*

196. The case of the medical man (195) is the only one in the human subject in which the morbid appearances have been ascertained. The *nostrils* were blocked up with an albuminous membrane. The whole mucous membrane of the *larynx*, *trachea*, *bronchi*, and even of some of the bronchial ramifications, was mottled with patches of lymph. The *gullet* and *stomach* showed red streaks here and there; and there was a *black eschar* on the *tongue*, and another on the *lower lip.*

3. *Of Poisoning with Muriate of Ammonia.*

197. When given to dogs, the muriate of ammonia irritates and inflames the parts it touches, and causes the ordinary symptoms of local irritation. But it also acts remotely. For, first, like arsenic and other poisons of the fourth order of irritants, it produces inflammation of the stomach, in

whatever way it is applied to the body,—that organ having been found affected when the salt was applied to the subcutaneous cellular tissue; and, secondly, it causes, when swallowed, excessive muscular weakness, slow breathing, violent action of the heart, and tetanic spasms—effects which cannot arise from mere injury of the stomach.—*Half a drachm* will thus kill a rabbit in eight or ten minutes, and *two drachms* a small dog in an hour. No instance of the operation of this salt as a poison on *man* has been met with.

Sect. II.—*Of the Alkaline Sulphurets.*

198. The *liver of sulphur*, or sulphuret of potassa of the pharmacopæia, is allied to the ammoniacal salts in action. It is interesting that its properties be accurately ascertained, as it has been much and erroneously resorted to as an antidote for some of the metallic poisons.

1. *Of the Action of the Sulphuret of Potassa and the Sulphuret of Soda, and their pathological symptoms in Man.*

199. A solution of six drachms and a half of *sulphuret of potassa*, secured in the stomach of a dog by a ligature on the gullet, caused death by tetamus in seven minutes, without leaving any particular morbid appearance in the body; inferior doses caused death in the same manner, but at a later period, and with the intervention of symptoms of irritation in the alimentary canal, which also was

seen red, black, or even ulcerated after death; a solution of twenty-two grains, injected into the jugular vein, killed a dog in two minutes, convulsions having preceded death, and the heart being found paralyzed immediately after death; a drachm and a half thrust in small fragments under the skin occasioned death by coma in thirteen hours, and extensive inflammation of the cellular tissue. There can be no doubt, therefore, that sulphuret of potassa is a true *narcotico-acrid* poison.*

200. In the *human subject,* four cases of poisoning with the sulphuret of potassa or sulphuret of soda have been collected. Of these cases two have proved fatal, both in less than *fifteen minutes*; and the symptoms preceding death were acrid taste, slight vomiting, mortal faintness, and convulsions, with an important chemical sign, the tainting of the air of the chamber with the odor of sulphuretted-hydrogen. The dose, in one case, was about three drachms. The two other patients who recovered, were for some days dangerously ill. The symptoms in them were burning pain and constriction in the throat, gullet, and stomach; frequent vomiting, at first sulphureous, afterwards sanguinolent; purging, at first sulphureous; sulphureous exhalations from the mouth; pulse, at first quick and strong, afterwards feeble, fluttering, and almost imperceptible, accompanied, in one

---

* Though thus evidently a narcotico-acrid poison, it is more convenient, and even more appropriate, to treat of sulphuret of potassa under the head of the alkaline poisons.

case, with sopor; finally, severe inflammation of the gullet, stomach and intestines, which abated in three days. One of these patients, took four drachms of *sulphuret of soda*, the other two ounces of *sulphuret of potassa;* but, it is probable that the latter dose must have been partly decomposed by long keeping.

2. *Of the Treatment of Poisoning with the Alkaline Sulphurets.*

201. The most appropriate treatment seems to consist in the instant administration of any diluent which is at hand, the subsequent administration of frequent doses of the CHLORIDE OF SODA, and then the antiphlogistic mode of subduing inflammation.

202. The *chloride of soda* or of *lime* may be called the antidote against this poison, as it decomposes the sulphuretted-hydrogen* which is evolved, the rapid disengagement of which is the probable cause of death in the quickly fatal cases. The symptoms at least are very nearly those of poisoning with *sulphuretted-hydrogen* when introduced into the system in a more direct manner. (587.)

3. *Of the Morbid Appearances caused by the Alkaline Sulphurets.*

203. The morbid appearances in the two fatal

---

* The chlorine of the chloride of soda or of lime unites with the hydrogen of the sulphuretted-hydrogen, and forms muriatic acid. The sulphuretted hydrogen evolved, arises from the decomposition of the water in which the sulphuret is dissolved.

cases (200) were great lividity of the face and extremities, and an exhaustion of the muscular contractility immediately after death; the *stomach* was red internally, and lined with a crust of sulphur; the *duodenum* also red; the *lungs* soft, gorged with black fluid blood, and not crepitating.

CHAPTER VIII.

CLASS FIRST—ORDER FOURTH.

204. The fourth order of the irritant class of poisons includes the compounds of the *metals.*—They are the oxides and salts of arsenic, mercury, copper, antimony, tin, silver, gold, bismuth, chrome, zinc, lead, barium, and strontium; to which may be added short notices of the toxicological effects of the rarer metals, and of iron.

205. Though arranged in the class of irritants, it must not be inferred that the action of these poisons is merely local. This is the case with a very few of them only, which produce chemical corrosion. The greater number likewise act directly on organs at a distance from the part to which they are applied; but the most striking symptoms generally produced are those of violent local irritation.

SECT. I. *On Poisoning with Arsenic.*

1. *On the Mode of Action of Arsenic, and the Pathological Symptoms it excites in Man.*

206. Arsenic,[*] like the narcotico-acrid poisons, has a two-fold action. One action is purely irri-

---

[*] The arsenical poisons are, *fly-powder*, arsenious acid, arsenite of copper, (*Scheele's green,*) arsenite of potassa, (*Fowler's solution,*) biarseniate of potassa, (*neutral arsenical*

tant, by virtue of which it induces inflammation in the alimentary canal and elsewhere. The other, although it seldom occasions symptoms of narcotism, properly so called, yet obviously consists in a disorder of parts or organs remote from the seat of its application.

207. It is also the general opinion of toxicologists, that arsenic occasions death more frequently through means of its remote effects, than in consequence of the local inflammation it excites. In some cases no symptoms of inflammation occur at all; and in many others, although inflammation is obviously produced, death takes place long before it has had time to cause material organic injury.—Nevertheless, in some, though comparatively few instances, the local action predominates so much, that the morbid changes of the part primarily acted on are alone adequate to account for death.

208. The information in respect to the channel through which the action of arsenic is established, is very vague. The general opinion seems to be that it acts through the blood.

209. As to the nature of the remote action of arsenic, toxicologists have, for the most part, been satisfied with calling it a disorder of the general nervous system; accordingly, the singular symp-

salt of Macquer,) arseniate of soda, (*Pearson's solution*,) arseniate of ammonia, arseniate of iron, and the sulphurets of arsenic, (*realgar*, *orpiment*, *king's yellow*.)

Metallic arsenic exerts no influence whatsoever on the living animal system.

toms which often arise in the advanced stage of lingering cases, clearly indicate a deranged state, sometimes of the brain, sometimes of particular nerves. But the whole train of symptoms, in the state of collapse, which accompanies or forms the chief feature of the acute cases of poisoning with arsenic, is that simply of depressed action of the heart; and this is the chief organ remotely acted on in such cases.

210. Arsenic acts with nearly the same energy whatever be the texture or organ to which it is applied. When applied to a fresh wound it acts with at least as great rapidity as when swallowed. It likewise acts with violence through the mucous membrane of the vagina, producing local inflammation, and the usual constitutional collapse. (209.) It acts with energy when applied to the conjunctiva of the eye; when injected into the rectum; and when it is applied to the surface of ulcers, though not under all circumstances. It farther possesses the power of acting through the unbroken skin.*

211. The *symptoms of* poisoning with arsenic may be advantageously considered under three heads.

212. In one order of cases, arsenic produces symptoms of irritation or inflammation along the course of the alimentary canal. Such cases are the most frequent. The person commonly sur-

---

* See Dr. Christison's Treatise, p. 294; 2d ed.

vives twenty-four hours, seldom more than three days; but instances of the kind have sometimes proved fatal in a few hours, and others have lasted for weeks. On the whole, however, if the case is much shorter than twenty-four hours, or longer than three days, its complexion is altered. In the mildest examples of the present variety, recovery takes place after a few attacks of vomiting, and a slight general indisposition for a day or two.

213. In regard to the ordinary progress of the symptoms, the first of a decisive character are sickness and faintness. In some instances, particularly when the poison was taken in solution, these symptoms have begun a few minutes after it was swallowed. In general, however, arsenic does not act for half an hour after it is swallowed.—On the other hand, its operation is seldom delayed beyond an hour.*

214. Soon after the sickness begins, or about the same time, the region of the stomach feels painful, the pain being commonly of a burning kind, and much aggravated by pressure. Violent fits of vomiting and retching then speedily ensue, especially when drink is taken. There is often also a sense of dryness, heat, and tightness in the throat, creating an incessant desire for drink; and this affection of the throat often precedes the vo-

---

* There are, however, some exceptions to this. Orfila has noticed an instance where there appears to have been scarcely any symptom at all for *five hours.—Dr. Christison's Treatise, p. 272.*

miting. Occasionally it is altogether wanting, at other times it is so severe as to be attended with fits of suffocation, and convulsive vomiting at the sight of fluids. Hoarseness and difficulty of speech are commonly combined with it. The matter vomited, as in other cases of long continued vomiting, is greenish or yellowish; but sometimes it is streaked or mixed with blood, particularly when the case lasts longer than a day.

215. In no long time after the first illness, diarrhœa generally makes its appearance, but not always. In some cases, instead of it the patient is tormented by frequent and ineffectual calls: in other cases, the great intestines are hardly affected at all.—About this time the pain in the pit of the stomach is excruciating, and is often likened by the sufferer to a fire burning within him. It likewise extends more or less throughout the rest of the abdomen, particularly when the diarrhœa or tenesmus is severe; and the belly itself is commonly tense and tender, sometimes also swollen, though not frequently—sometimes even on the contrary drawn in at the navel.

216. When the diarrhœa is severe, the anus is commonly excoriated, and affected with burning pain. In such cases the burning pain may extend along the whole course of the alimentary canal, from the throat to the anus. Nay, at times the mouth and lips are also inflamed, presenting dark specks or blisters.

217. Sometimes there are likewise present, signs

of irritation of the *lungs* and *air-passages*—almost always shortness of breath (which, however, is chiefly owing to the tenderness of the belly)—often a sense of tightness across the bottom of the chest, and more rarely, decided pain in the same quarter, darting also through the upper part of the chest.

218. Sometimes *peripneumony* has appeared a prominent affection during life, and been distinctly traced in the dead body.

219. In many instances, too, the *urinary* passages are affected, the patient being harassed with frequent, painful and difficult micturition, swelling of the penis, and pain in the region of the bladder, or, if a female, with burning pain of the vagina and excoriation of the labia. Sometimes the irritation of the urinary organs is so great as to be attended with total suppression of urine, continued for several days. Urinary symptoms are seldom present unless the lower bowels are likewise strongly irritated; but are then seldom altogether wanting. They are seldom well marked in cases of the present variety, unless life is prolonged three days or more.

220. When the symptoms of irritation of the alimentary canal have subsisted a few hours, convulsive motions often occur in a greater or less degree. They commence on the trunk, afterwards extend over the whole body, are seldom violent, and generally consist of nothing else than tremors or twitches. Another convulsive affection, and a

very distressing one, is cramps of the legs and arms. This symptom may be a concomitant of every kind of diarrhœa; but in that caused by arsenic it is peculiarly severe and frequent.

221. The general system always sympathises acutely with the local derangement. The pulse commonly becomes very small, feeble and rapid soon after vomiting sets in; and in no long time it is often imperceptible. This state of the pulse is naturally attended with great coldness, clammy sweats, and even lividity of the feet and hands.—Another symptom referrible to the circulation which has been observed, though very rarely, is palpitation.

222. The *countenance* is commonly collapsed from an early period, and almost always expressive of great torture and extreme anxiety; the eyes are red and sparkling; the tongue and mouth parched; and sometimes little white ulcers or apthæ break out on the velum and palate.

223. *Delirium* sometimes accompanies the advanced stage, and stupor also is not unfrequent.—Death, in general, comes on calmly, but is sometimes preceded by a paroxysm of convulsions.

224. In some cases of the kind now under consideration, a remission, or even a total intermission of all the distressing symptoms has been witnessed, particularly when death is retarded till the close of the second or third day. This remission which is accompanied with dozing stupor, is most generally observed about the beginning of the second day.—

It is merely temporary, the symptoms speedily returning with equal or increased violence. Sometimes the remission occurs oftener than once.

225. There are deviations from the symptoms as above described; but upon the whole they are rare. The symptoms of poisoning by arsenic are in general very uniform.

226. The second variety of poisoning with arsenic, includes a few cases in which the signs of inflammation are far from violent, or even altogether wanting, and in which death ensues in five or six hours, or a little more—at a period too early for inflammation to be always properly developed. The symptoms are then by no means so striking as in the first variety, and are referrible chiefly to the mode of action, which is probably the cause of death in most cases,—an action on some remote organ.

227. These symptoms, in some animals, occasionally amount to absolute *narcotism*. In man the symptoms very seldom resemble so closely those of the narcotic poisons.*

228. In some cases of the kind now under con-

---

* The following case is cited by Dr. Christison as an instance of pure narcotic symptoms succeeding and displacing the more usual symptoms of irritation. A young man who got an arsenical solution from an old woman, to cure ague, was attacked after taking it, with vomiting and loud cries, afterwards with incoherent talking, then fell into a deep sleep, and finally perished in convulsions, in five hours. This case is quoted from *Henke's Journal of Medical Jurisprudence.*

sideration, one or two attacks of vomiting occur at the usual interval after the taking of the poison; but it seldom continues.

229. The most uniform and remarkable affection is extreme faintness, amounting at times to deliquium. Occasionally there is some stupor, or rather oppression, and often slight convulsions. The pain of the epigastrium is generally present; but it is slight, and seldom accompanied with the other signs of internal inflammation.

230. Death commonly takes place in a few hours. Yet, even when it is retarded till the beginning of the second day, the faintness and stupor are sometimes more striking features in the case than the symptoms of inflammation in the stomach.

231. This variety of poisoning with arsenic has been hitherto observed only under the three following circumstances,—when the dose of the poison was large,—when it was in small masses,—and when it was in a state of solution.

232. The third variety of poisoning with arsenic, occurs chiefly in persons, who, from having taken but a small quantity, or from having vomited soon after, are eventually rescued from destruction; but it has also been met with in some cases where death ensued after a protracted illness. In such cases the progress of the poisoning may be divided into two stages.

233. The first train of symptoms is exactly that of the first or inflammatory variety, (213—214,) and is commonly developed in a very perfect and violent form.

234. In the second stage the symptoms are referrible to nervous irritation. These generally come on when the former begin to recede; yet, sometimes they make their appearance earlier, while the signs of inflammation in the alimentary canal continue violent; and more rarely both classes of symptoms begin about the same period.

235. The nervous affection varies in different individuals. The most formidable, is coma; the slightest, a peculiar, imperfect palsy of the arms and legs, resembling what is occasioned by the poison of lead; and between these extremes, have been observed epileptic fits, or tetanus, or an affection resembling hysteria, or mania. Sometimes the convulsions caused by arsenic, assume the form of pure tetanus. Occasionally, instead of being palsied, the limbs are rigidly bent and cannot be extended.

236. Finally, a striking fact in relation to the action of arsenic upon the animal system, is, that it produces signs of irritation in the stomach, in whatever manner it is introduced into the body.

2. *Of the Treatment of Poisoning with Arsenic.*

237. No chemical antidote is known for poisoning with arsenic; neither are we acquainted with any belonging to the rarer class of counter-poisons which operate by exciting a counter action on the system.

238. If vomiting should be delayed, as often happens, for half an hour or more, advantage ought to be taken of the opportunity to administer an

emetic of the *sulphate of zinc*, with the view of withdrawing the poison in mass, before it is diffused over the stomach; and for the same purpose, *milk** should be drunk both before and after vomiting has begun, as it appears to be the best substance for enveloping the powder, and so procuring its discharge. Emetics are unnecessary when vomiting has commenced, in consequence of the operation of the poison. When milk in sufficient quantity cannot be procured, strong farinaceous decoctions will probably prove useful.

239. The patient should never be allowed to exhaust his strength in retching, without a little milk or other fluid on his stomach to act on. At the same time, it is probable that large draughts are injurious; and that, unless the stomach is allowed to contract fully and frequently on itself, it cannot discharge the mucous secretion on its surface, in which the powder of arsenic is in general closely enveloped.

240. The *stomach-pump*,† although it has been

---

* Oil may be also safely administered. The salutary effects of oil is a popular belief among the smelters of arsenical ores in Cornwall, England.

† Dr. A. T. Thomson recommends that when the stomach-pump is used, lime-water be employed to wash out the stomach instead of common water; the union of lime and arsenious acid forming a nearly insoluble salt. He likewise advises lime-water to be drunk immediately after the first act of vomiting brought on by the administration of sulphate of zinc, for the purpose of neutralizing and diminishing the activity of the poison in the stomach.

applied to cases of poisoning with arsenic, does not seem to possess any advantage whatever, over the natural efforts of nature, if seconded by draughts of liquids, and is probably less effectual in expelling the mucus which envelopes the poison.

241. Supposing the poison to have been removed from the stomach, or that the patient has been put on the course which appears best fitted to accomplish that end,—two indications of cure remain to be fulfilled, namely, to allay the inflammation of the alimentary canal, and to support the system under that extraordinary depression which it undergoes in the generality of cases.

242. In a few even very aggravated cases, the purest and most vigorous antiphlogistic treatment has been resorted to with success. But blood-letting ought not to be practised, till the poison is nearly all discharged from the stomach, because it promotes absorption by causing emptiness of the blood-vessels. Neither is it probable that any material advantage will be derived from topical blood-letting, at least, in the early stage, because if depletion is to be of use at all, it must be carried at once to a far greater extent than it is possible to attain by local evacuants.

243. Blisters on the abdomen will prove useful auxiliaries in the advanced stage.

244. Opium in repeated doses, will, without doubt, prove useful, when the poison has been removed, and the inflammation subdued by blood-letting. The free administration of opium after

copious depletion, is conceived to be applicable to the form of gastritis as caused by arsenic; but for the safe employment of this method, it is essential that the poison be completely removed from the stomach and intestines.

245. The use of laxatives is particularly required in all cases in which there is tenesmus instead of diarrhœa, or where, in the latter stages, diarrhœa is succeeded by constipation; and *castor oil* is the laxative generally preferred. While diarrhœa is present, and the evacuations are profuse, or the intestines have been thoroughly emptied, laxatives are unnecessary or even hurtful; but emollient clysters are advisable. When the anodyne system of treatment is resorted to, the opium may be given in the form of enema, or rather as a suppository. In short, so far as regards the intestinal affection, the treatment of the acute stage of dysentary is to be enforced.

246. When convalescence has begun, the principal object is to support the system by mild nourishment, avoiding at the same time stimulant diet of every kind, but especially spirituous and vinous liquors. Whatever may be the difference of results obtained with the antiphlogistic mode of cure, the opposite system has been invariably detrimental.*

---

* A singular case, in which *Peruvian bark* seems to have acted the part of an antidote to arsenic, is related in the xxi No. of the American Journal of Medical Sciences; and in the xxiii No. of the same Journal, in allusion to the case, anoth-

3. *Of the Morbid Appearanccs caused by Arsenic.*

247. There are some cases in which little or no morbid appearance is to be seen at all. These all belong to the second variety (226) of poisoning, which is characterised by the absence of local inflammation, and the presence of symptoms indicating an action on the heart, or some other remote organ. In such circumstances death takes place before a sufficient interval has elapsed for the inflammation to be developed. But, whenever the symptoms have clearly indicated inflammation, corresponding appearances may be detected in the dead body.

248. In the ordinary cases in which death is delayed till the second day, or later, a considerable variety of diseased appearances has been observed. The first set of appearances are those indicating inflammation of the alimentary canal, viz. redness of the *throat* and *gullet*, redness of the *villous* and *peritonæal* coats of the stomach, blackness of its villous coat from extravasation of blood into it; softening of the villous coat, ulceration of that as well as of the other coats, effusion of coagulable lymph on the inner surface of the stomach, extravasation of blood among its contents, finally, red-

---

er correspondent remarks, that Professor J. A. Smith, of New York, had stated to his class, that a medical friend related to him several cases of poisoning by arsenic, which he had successfully treated by administering large doses of Peruvian bark and milk.

ness and ulceration of the *duodenum*, and other parts of the *intestinal* canal, and more particularly of the *rectum;* to which may be also added, though not properly a morbid phenomenon, certain appearances put on by the arsenic which remains undischarged.

249. Redness of the throat and gullet is not common, at least it does not often occur in the description of cases. But, on the whole, it appears probable that inflammation of these parts would be found more frequently in the reports, if it was more carefully looked for.

250. Redness of the inner coat of the stomach is a pretty constant effect of arsenic, when the case is not very rapid. There is nothing, however, in the redness caused by this poison, any more than in the redness of inflammation generally, by which it is to be distinguished from the pseudo-morbid varieties.*

251. However severe the inflammation of the inner membrane of the stomach may be, inflammatory redness of the peritonæal coat is seldom found. Yet inflammatory vascularity does occur sometimes on the peritonæal coat. A common appearance when the internal inflammation is great, and one often unwarily put down as inflammation of

---

* By pseudo-morbid redness is here understood, that which originates after death, as contra-distinguished from real inflammation and redness caused by poisons. This subject, which is one of much importance to the medical jurist, is fully examined in Dr. Christison's Treatise, p. 118 of the 2d ed.

the peritonæum, is turgescence of the external veins, sometimes so great as to make the stomach look livid.

252. Blackness of the villous coat, from effusion of altered blood into its texture, is sometimes met with. When the color is brownish black or greyish black, not merely reddish black, where the inner membrane is elevated into firm knots or ridges by the effusion, and the black spots are surrounded by vascularity or other signs of reaction, the appearances strongly indicate violent irritation, which are never imitated by any pseudo-morbid phenomenon.

253. Sometimes the villous, and also, more rarely, the other coats of the stomach are found actually destroyed, and removed in scattered spots and patches. This loss of substance is occasionally owing to the same action which causes softening and brittleness of the villous coat, the action, however, having been so intense as to cause gelatinization. Destruction of the coats of the stomach by ulceration is not a very common consequence of poisoning with arsenic, as death frequently takes place before that process can be established. For the most part, it is hardly to be looked for unless the patient survived nearly two days. Complete perforation of the stomach is of exceedingly rare occurrence. Destruction of the coats of the stomach, as produced by arsenic, has been variously described by authors, under the terms erosion, corrosion, dissolution, ulceration.

But the correct mode of describing it appears to be by the term *gelatinization*, or ulceration, according to the nature of the diseased action by which it is induced. Arsenic is not a corrosive.

254. Various secretions have been found on the inner surface of the stomach. The *mucous secretion* of the inner membrane is almost always increased greatly in quantity. Frequently it is thin and glairy as in its natural state; but sometimes it is both abundant and solid, as if coagulated; and then it forms either a uniform attached pellicle, or loose shreds floating among the contents. It is known from tough mucus, to which it bears some resemblance, by its reticulated disposition, and by the threads of the reticulation corresponding with inflamed lines on the stomach beneath.

255. Another and a very common appearance, is the presence of a *sanguinolent fluid*, or even of actual blood in the cavity of the stomach. In several cases, the subject of analysis was a thick, brownish red fluid, evidently containing a large proportion of blood.

256. Among the appearances observed in the stomach, the presence of the poison may be included, though not properly speaking a morbid appearance. Sometimes the arsenic exists dissolved in the contents; more commonly it is present there in the solid form; and is then either in loose particles, or is enveloped in coagulated mucus, or in little clots of blood, or is wrapped up

in the more solid parts of the contents. Frequently it adheres to the coats of the stomach, and is then either scattered in the form of fine dust, or collected in little knots. The adhering particles are always covered by mucus; they are often surrounded by redness of the membrane, or by effused blood; and sometimes they are imbedded in little ulcers. A remarkable appearance which the arsenic sometimes puts on is a brilliant yellowness of its surface, owing to its conversion into the sulphuret. Care must be taken, however, not hastily to consider as arsenic every white powder which may be found lining the inside of the stomach.—Many other white powders may obtain entrance from without; and, besides, small, white, shining, pulverulent scales, not unlike finely powdered arsenic, but really composed of animal matter, are sometimes formed on the mucous coat of the stomach and intestines.

257. Redness of the *mucous membrane* of the *intestines* is often present when the stomach is much inflamed. Dissolution of the mucous coat is much less frequent in the intestines than in the stomach. Ulceration occasionally occurs in lingering cases.

258. The signs of inflammation are seldom distinct in the small intestines much lower down than the extremity of the duodenum; and they do not often affect the color. But it is a curious fact, that the *rectum is* sometimes much inflamed, though the colon, and more particularly the small intes-

tines are not. A common appearance in lingering cases is excoriation or ulceration of the anus, and in some cases it is said that even gangrene has been produced.

259. Redness of the *diaphragmatic part* of the *pleura*, or even of the whole of that membrane, has been at times observed. Inflammation of the *lungs* themselves has also been noticed. And the inner membrane of the windpipe is said to be sometimes affected with inflammatory redness.

260. The *organs of generation* are occasionally affected. The penis in the male, and the labia in the female, have been found distended and black. In one case, the external parts of generation (in a female) were surrounded by gangrene; and in another, the inside of the uterus and fallopian tubes was inflamed.

261. With regard to the state of the *blood*, it is observed, in general terms, that in animals killed by arsenic it is commonly fluid every where.—This condition, however, is not uniform. It is further stated that the blood is black, semigelatinous, and sometimes pultaceous.

262. Of late it has been suspected that in general arsenic, besides the antiseptic virtues which it has been long known to possess when directly applied in moderate quantity to animal substances, also possesses the singular property of enabling the bodies of men and animals poisoned with it

both to resist decay unusually long, and to decay in an unusual manner.*

SECT. II.—*On Poisoning with Mercury.*

1. *Of the mode of action of Mercury and the Pathological Symptoms it excites in man.*

263. The cases of poisoning with mercury, which have been observed in the human subject, may be conveniently arranged under three varieties. In one variety the sole or leading symptoms are those of violent irritation of the alimentary canal. In another variety, the symptoms are at first the same as in the former, but subsequently become conjoined with salivation and inflammation of the mouth, or some of the other disorders which indicate mercurial erethysm, as it is called. In a third variety, the preliminary stage of the last is wanting, and the symptoms are from the beginning, those of mercurial erethysm in one or other of its multifarious forms.

264. The first variety of poisoning with mercury is remarked only in those who have taken considerable doses of its soluble salts, particularly corrosive sublimate. The second is caused by the same preparations. The third may be caused by any of the compounds of mercury.

265. The symptoms in the first variety are very

---

* For illustrations of this see Dr. Christison's Treatise, p. 312–318.

like those already described as occurring in the ordinary cases of poisoning with arsenic,—namely, vomiting, especially when any thing is swallowed, violent pain in the pit of the stomach, as well as over the whole belly, and profuse diarrhœa. But there exists between the effects of the two poisons some shades of difference to which it is necessary to attend.

266. 1. Taking *corrosive sublimate*, as the best example of the preparations which cause this variety of poisoning with mercury, the symptoms begin much sooner than those caused by arsenic.—The symptoms of irritation in the throat may begin immediately, nay, during the very act of swallowing; and those in the stomach may appear either immediately, or within five minutes.

267. 2. The taste is much more unequivocal and strong. Even a small quantity of corrosive sublimate, either in the solid or fluid state, and considerably diluted, has a strong and so horrible a taste, that no one could swallow it in a form capable of causing much irritation in the stomach without being at once made sensible, by the taste, that he had taken something unusual and injurious.

268. 3. The sense of acridity which it excites in the gullet during the act of deglutition, and throughout the whole course of the subsequent inflammation of the alimentary canal, is usually much stronger. If the dose is not inconsiderable, or very largely diluted, or in the solid form, the sense of tightness, acridity, or burning in the

throat and gullet during deglutition is often far greater than ever occurs in the instance of arsenic; and sometimes it is very severe, even when corrosive sublimate is taken in the solid form.—The tightness and burning in the throat often continue throughout the whole duration of the poisoning; and may be so excessive as to cause complete inability to swallow, or even to speak. Occasionally the affection of the throat is the only material injury inflicted by the poison. The greater violence of the action of corrosive sublimate on the throat, than that of arsenic, is evidently owing to its greater solubility and powerful chemical* operation on the animal textures.

---

* It is now generally believed, by chemical toxicologists, that most animal fluids and solids, various vegetable fluids and solids, extracts, fixed oils, volatile oils and resins, possess the power of *decomposing* corrosive sublimate. Among the soluble animal principles, albumen, casein, osmazome, and gelatin possess it in a high degree, but above all, *albumen.*—Fibrin, muscular fibre, the mucous and serous membranes, the fibrous textures, and the brain, have all the same effect.—They become firmer, brittle, white, and a white powder detaches itself from their surfaces, which is a compound of chlorine, mercury, and the animal matter with which the corrosive sublimate is in contact. This *chemical* action, which has been proved to take place in the living, as well as in the dead body, is the source of the corrosive property of the poison. The experiment which is made to show that the bichloride has undergone a chemical change under the circumstances adverted to, is the following:—If the precipitate, caused by albumen in a solution of corrosive sublimate, previously dried, be boiled in a solution of caustic potassa, the organized mat-

269. 4. Instead of the contracted ghastly countenance observed in cases of poisoning with arsenic, (but which is not invariable in that kind of poisoning,) those who are suffering under the primary effects of corrosive sublimate have frequently the countenance much flushed, and even swelled.

270. 5. Corrosive sublimate seems to occasion, more frequently than arsenic, the discharge of blood by vomiting and purging—obviously because it is a more powerful irritant.

271. 6. It gives rise, perhaps, more frequently to irritation of the urinary passages. This irritation consists generally in frequent and painful micturition; but the secretion of urine is often suppressed altogether. Sometimes the urinary irritation is attended with symptoms of excitement of the external parts, such as swelling and blackness of the scrotum, and erection of the penis.

272. 7. Corrosive sublimate is more apt than arsenic to cause nervous affections during the first inflammatory stage. The tendency to doze, which sometimes interrupts the inflammatory symptoms caused by arsenic, has been more frequently observed in cases of poisoning with corrosive sublimate. The same may be said of the tremors and

---

ter is dissolved, and a heavy, grayish black powder is formed, which is the *protoxide* of mercury. Now, as the potassa thus separates the mercury in the form of protoxide, it follows, that it existed in the compound in the form of a protochloride. If it had existed in the form of bichloride, then the precipitate would have been the yellow hydrated deutoxide of the metal.

twitches of the extremities. Sometimes the stupor approaches even to absolute coma; and the twitches occasionally amount to distinct, nay, violent convulsions. In other instances, paraplegia has been witnessed.

273. 8. The effects of the mercurial irritation are fully more curable than those of arsenic. Recovery has taken place even after half an ounce was swallowed, with the effect of inducing both bloody vomiting and purging. And, finally, deviations from the ordinary course, and combination of the symptoms, appear to be more rare in the instance of corrosive sublimate than in that of arsenic.

274. The usual duration of the first variety of mercurial poisoning, and the extremes of its duration, may be stated as follows: The ordinary duration in fatal cases is from twenty-four to thirty-six hours. One case is mentioned, which lasted three days; and in another, life was prolonged under great agony from pain in the belly, bloody vomiting, diarrhœa, and suppression of urine, but without salivation, for no less than eight days.—The shortest duration yet recorded is two hours and a half. Next to this, the shortest case recorded proved fatal in eleven hours.

275. The second variety of poisoning with mercury comprehends the cases which begin like the former, with irritation in the alimentary canal, but in which the symptoms of what is called mercurial erethysm,—the leading affection of which is in-

flammation of the organs in and adjoining the mouth, and more particularly of the salivary glands,—gradually supervene.

276. In regard to the period of the poisoning at which these secondary affections may and usually do commence, it may be doubted whether salivation has ever occurred sooner than the beginning of the second; and the most usual date of its commencement is towards the close of the second day.

277. As to the total duration of this variety in fatal cases, one proved fatal on the fourth day, salivation having begun on the second: another case is quoted in which the gastro-enteritic symptoms were succeeded by ptyalism about the same period, and which proved fatal in fifteen days. These periods, however, probably do not form the extremes.

278. The third variety of poisoning with mercury comprehends all the forms of what is called mercurial erethysm.*

279. Mercury acts as a poison on man in whatever way it is introduced into the body—whether it is swallowed, or inhaled in the form of vapor, or applied to a wound, or even simply rubbed or placed on the sound skin. But the kind of action

---

* It does not enter within the scope of this Manual to consider the multifarious secondary and chronic effects of mercury. The reader, however, is referred to Dr. Christison's Treatise, p. 365–376, for some excellent remarks, bearing on the medical evidence of poisoning with mercury, and for some important considerations concerning it, in regard to medical police.

differs according to the channel by which it is introduced.

280. The most ordinary and dangerous cases of poisoning arise from the introduction of corrosive sublimate into the stomach. The poison then kills by corroding or inflaming the alimentary canal, or by causing salivation and its concomitants. (266–278.)

281. When applied to a wound or ulcer, corrosive sublimate does not often occasion dangerous symptoms. Yet it is sometimes a hazardous remedy. It is not a convenient escharotic, even in a concentrated state; for its escharotic action is not incompatible with its absorption; at all events it certainly sometimes acts constitutionally through the surface of wounds and ulcers, and the symptoms brought on in this way are generally violent.—They are the symptoms of mercurial salivation, accompanied at times with well marked inflammation of the alimentary canal. When applied to sores in a diluted state, it has been known to cause dangerous effects if too long persevered in.

282. One of the readiest modes of bringing the system under the poisonous action of mercury, is by introducing its preparations into the lungs.—The fluid preparations act rapidly through the lining membrane of the air-passage. But the effects of mercury through this channel, are much better exemplified when its preparations have been inhaled in the form of vapor. Corrosive sublimate, when incautiously sublimed in chemical experi-

ments, has been often known to cause serious effects.

283. The phenomena produced in this way, by the various preparations of mercury in more violent cases, are sometimes protracted tremors, sometimes severe ptyalism and protracted dysentery, sometimes salivation and gangrene of the mouth, ending fatally.

284. Several extraordinary instances have happened, of poisoning from long continued inhalation of the vapors which arise from metallic mercury. The vapors thus discharged, may produce the worst species of mercurialism, if they are diffused through an apartment insufficiently ventilated.

285. The action of mercury is often violently excited when it is applied to the skin, even not deprived of its cuticle. The effects of mercurial inunction form a well known and satisfactory proof of this. But it is not, perhaps, so generally known, that the more active preparations, such as corrosive sublimate, may, like arsenic, cause, through the sound skin, effects almost as violent as through the alimentary canal.

286. The effects of mercury, as a poison, differ with the chemical form in which it introduced into the system.

287. In its metallic state it is probably inactive.*

---

* Nevertheless it must be borne in mind, that the vapors of metallic mercury, even at ordinary temperatures, produce salivation when inhaled; and it is still a question, whether the mercury in the blue pill mass and blue ointment, be in a state of oxidation or not.

288. The *sulphurets** of mercury, like the metal, are not possessed of any deleterious action on the animal economy.

289. *Red precipitate* and *turbith mineral* act as irritants, besides possessing the property common to all mercurial compounds, of causing mercurial erethysm. But they are not escharotics, though generally termed such. That is, they do not chemically corrode the animal textures.

290. *Corrosive sublimate* is a powerful corrosive or irritant, according to the dose and state of concentration; and it also excites mercurial erethysm in a violent degree.

291. The *nitrates* are also corrosive. The *cyanide* or *prussiate* of mercury appears to resemble corrosive sublimate closely in all its effects, except that it does not corrode chemically.

292. The *protochloride* or *calomel*, and probably also the *protoxide*, are the most manageable of the preparations of mercury, for inducing ptyalism.—Calomel is also an irritant; that is, it causes irritation and inflammation in the alimentary canal when swallowed.†

---

* There are two sulphurets of mercury; the protosulphuret is black, the bisulphuret is red, and is employed in the arts by the names of *factitious cinnabar* and *vermillion*. The *ethiops mineral* of the shops, is a mixture of sulphur and bisulphuret of mercury.

† The other preparations of mercury in use, are, the iodides of mercury, ammoniated mercury, (*white precipitate*,) and acetate of mercury; to which may be added a few pharmaceu-

2. *Of the Treatment of Poisoning with Mercury.*

293. The treatment of poisoning by the compounds of mercury may be referred to two heads; that which is required when irritation of the alimentary canal is the prominent disorder, and that which is calculated to remove mercurial salivation.

294. Irritation and inflammation of the alimentary canal are to be treated nearly in the same way as when arsenic has been the poison swallowed.—But in the instance of *corrosive sublimate*, we possess convenient and effectual *antidotes*.

295. *Albumen*, in the form of white of eggs, beat up with water, impairs or destroys the corrosive properties of the bichloride of mercury, by converting it into a protochloride of mercury and albumen.* The white of *one* egg is required to render *four grains* of the poison innocuous. Albumen is chiefly useful in the early stage of poisoning with corrosive sublimate, and is particularly called for when vomiting does not take place.—

---

tical preparations that contain mercury, and an ignorance of the composition of which might give rise to accidents:—*Van Sweeten's liquor*, *mercurial ether*, *syrup of mercurial ether*, *mercurial lotion*, *phagedænic water*, *mercurial gargle*, *Cyrillo's salve*, *escharotic troches*, all of which contain, or are prepared with corrosive sublimate; *Hahneman's soluble mercury*, which is obtained by pouring liquid ammonia into a solution of pure protonitrate of mercury; and *Keyser's anti-syphilitic pills*, containing one-fourth of a grain of acetate of mercury.

*See note to (268.)

But it farther appears to be an excellent demulcent in the advanced stages.*

296. *Gluten*, as a very effective antidote, is best administered in the form of an emulsion with soft soap. This is made by mixing, partly in a mortar, and partly by the hand, five or six parts of fresh gluten with fifty parts of a solution of soft soap.—And in order to have a store always at hand, the emulsion, after standing and being stirred for twenty-four hours, is to be evaporated to dryness in shallow vessels, and reduced to powder. The powder may be converted into a frothy emulsion in a few minutes.†

297. *Milk*, when neither albumen or gluten are at hand, is a convenient antidote of the same kind.

298. *Iron-filings* would appear to be also a good antidote. The iron obviously acts by reducing the corrosive sublimate to the metallic state.

299. *Meconic acid* and the *alkaline meconates*, it is thought, will prove valuable antidotes for corrosive sublimate. As to the old antidotes,—such as

---

* "It is, however," says Dr. A. T. Thomson, "a curious fact, and one which renders albumen a less useful antidote than might be expected, that in excess it does not effectually clothe the irritant influence of the poison; for the precipitate is re-dissolved."

† Wheat flour, which contains from nineteen to twenty-four per cent. of gluten, and is almost always at hand, may be indicated as an effectual antidote, and as a substitute for gluten. It may be administered by simply diffusing two or three table spoonfulls in a tumbler of water; or, if it can be as conveniently procured, in a cup of milk.

the alkaline carbonates, the alkaline hydrosulphates, cinchona, mercury, charcoal,—they have all been found to be inefficacious.

300. The treatment of mercurial salivation consists in exposure to a cool pure air, nourishing diet, and purgatives, if the intestinal canal is not already irritated. In some of the inflammatory affections which it induces, venesection is required; in others, it is hurtful. In some complaints induced by mercury, as in iritis, the poison appears to be its own antidote; for nothing checks the inflammation so soon, and so certainly as mercurial salivation.

301. *Tartar emetic* frequently repeated, so as to act on the skin, has been proposed to check mercurial salivation. And large doses of the *acetate of lead*, have likewise been recommended as an effectual antidote for the same purpose.

3. *Of the Morbid Appearances caused by Mercury.*

302. The *mouth* and *throat* are more frequently affected than by arsenic; and a singular appearance sometimes remarked, and not excited by arsenic, is *shrivelling* of the *tongue*, with great enlargement of the papilla at its root.

303. The disorder of the alimentary canal is also usually more general, and reaches a greater height before death takes place. Sometimes the irritation and organic injury, are confined to the stomach; but more commonly the *throat*, *stomach*, *gullet*, *rectum*, nay, even also the *colon*, are affected. The

black extravasation into the mucous membrane of the stomach, which has been already described (242) as a common effect of the more violent irritants, is often produced by corrosive sublimate.

304. The coats of the stomach, and also those of the intestines, more particularly the colon and rectum, have frequently been found destroyed. This destruction of the coats is of two kinds,—corrosion and ulceration.

305. Corrosion is the result of chemical decomposition of the tissues. This kind is evidently to be looked for only when the quantity has been considerable, and the dose concentrated. Nay, even then it is rare. For, on account of the solubility of corrosive sublimate, the facility with which it is decomposed by the secretions or accidental contents of the stomach, and the violence and frequency of the vomiting, this poison is peculiarly liable to be prevented from exerting its corrosive action on the membranes. Hence, it is that, the proper chemical corrosion of the coats of the stomach is seldom witnessed in man.

306. The appearance of chemical corrosion differs according to the rapidity of the poisoning. In the most rapid cases on record, the corrosion was black, like the charring of leather with a red-hot coal, and the rest of the stomach scarlet-red or deep rose-red, the extent of the corrosion varying from one inch, ("as big as a half crown,") to three inches in diameter. In a case, when life was prolonged for eight days, there was a patch on the under surface of the stomach as large "as two crown-pieces,"

hard, elevated, and of a very dark olive, or almost black color, besides very general erosion of the villous coat.

307. When the poisoning is slow, the disorganised matter sloughs away, leaving an ulcerated cavity. The corrosion, if examined before the slough is thrown off, will be found to possess an important peculiarity:—the disorganised tissue yields mercury by chemical analysis. On this point, two rules may be laid down, by means of which corrosions of this kind may be distinguished from most forms of spontaneous erosion. On the one hand, if death takes place too soon for reaction to have begun, the injured membrane will not have sloughed away, and yields mercury by analysis; and it is important to remember, that when the slough is of moderate size it is often very slowly detached. If, on the other hand, in consequence of life having been prolonged for some time, the disorganized part has sloughed off, and been discharged by vomiting, it is probable, that mercury will no longer be found; but, then the ulcer left is distinguished from most varieties of spontaneous erosion by unequivocal signs of surrounding reaction.

308. The other form of destruction of the coats of the alimentary canal is common ulceration, either such from the beginning, or what was originally corrosion converted into an ulcer, in consequence of the disorganised spot being thrown off by sloughing.

309. All the other effects of inflammation may be produced by corrosive sublimate, as by arsenic

and other irritants. More frequently here than in the case of arsenic peritonæal inflammation is met with.

310. The urinary organs, and particularly the *kidneys*, are often much inflamed, and the *bladder* is commonly contracted.

SECT. III. *Of Poisoning with Copper.*

1. *Of the Action of Copper, and the Pathological Symptoms it excites in Man.*

311. The salts of copper act in whatsoever way they are introduced into the system, and the more energetically, the more directly they enter the blood.

312. The symptoms caused by copper have at least two varieties in their character. One class arises from its local action on the alimentary canal; the other from its operation on distant organs.

313. The symptoms caused by the soluble salts*

---

* "It is pretty certain that copper, like all other metals, is not deleterious, unless oxidated, and that its soluble salts are by far the most energetic. The sulphuret is equally innocuous with the metal, if pure; but, it appears probable, that it becomes oxydated by long exposure to the air, and passes into the state of sulphate. The power of the oxydes has not been ascertained: they are certainly poisonous; but they are probably not very active, on account of their great insolubility. The hydrated deutoxide is probably more active. But it is chiefly in the soluble salts that we are to look for the full development of the action of this poison. A very small quantity of the sulphate will prove fatal."—C.

The most common preparations of copper found in comof copper in man, are, in a general point of view, the same as those caused by arsenic and corrosive sublimate. But there are likewise some peculiarities.

314. The first symptoms may be violent headache, then vomiting and cutting pains in the bowels, and afterwards cramp in the legs and pains in the thighs. Sometimes throughout the whole course of the symptoms there is a peculiar coppery taste in the mouth, and a singular aversion to the smell of copper.

315. Another symptom, which occasionally occurs in this kind of poisoning, and never, it is believed, in poisoning with arsenic or corrosive sublimate, is jaundice. Such are the symptoms when the case does not prove fatal.

316. When the poisoning ends fatally, convulsions, palsy, and insensibility, the signs in short of some injury done to the brain, are very generally present.

317. Besides these effects when introduced in considerable doses, and in the form of soluble salts, copper is said to produce other disorders when applied to the body for a long time in minute quantities, and in its metallic or oxidised state.

merce, and in the shops are, acetate of copper, (*verdigris*,) binacetate of copper (improperly called *distilled verdigris*,) ammoniuret of copper, and *lapis divina*, which is a preparation of sulphate of copper, nitrate of potassa, alum and camphor, and is used as a collyrium.

But the notions entertained on this subject must be received with some limitation.

2. *Of the Treatment of Poisoning with Copper.*

318. *Albumen*[*] in the form of the white of eggs is the best antidote for the poisonous preparations of copper. *Ferrocyanate* of *potassa* is equally effective; and *metallic iron* is also a good antidote.

319. On account of its solvent power over the insoluble compounds formed by the salts of copper with animal and vegetable matters, vinegar, which has been frequently used, must be considered injurious rather than useful.[†]

3. *Of the Morbid Appearances caused by Copper.*

320. The appearances found in the body after death, by poisoning with copper, are chiefly the signs of inflammation. If death takes place very rapidly, however, it is probable that no diseased appearance whatever will be perceptible.

321. When death ensues more slowly, the marks of inflammation coincide with the signs of irritation during life. Under such circumstances the whole skin, in a case related by Pul, was yel-

---

[*] Albumen, milk, tea, and coffee, are supposed to decompose the solutions of copper. This has been doubted by some toxicologists, who recommend in preference the use of the stomach-pump, and afterwards to reduce the excitement by blood-letting.

[†] SEE APPENDIX A, *on the Adulterations by Copper of articles of food and drink.*

low. The *intestines*, particularly the lesser intestines, were of an unusual green color, inflamed, and here and there gangrenous. The *stomach* was also green; its inner coat was excessively inflamed; and near the pylorus there was a spot as big as a crown, where the villous coat was thick, hard, and covered with firmly adhering verdigris. The *lungs* are likewise said to have been inflamed.—The *blood* was firmly coagulated. In other cases related by Wildberg, the skin on various parts, and particularly on the face, was yellow; but on the depending parts it was livid. The outer coat of the stomach and intestines was here and there inflamed. The duodenum and jejunum, and likewise the gullet, were in a similar state. The blood in the heart and great vessels was black and fluid.

322. The intestines have been found perforated by ulceration, and their contents thrown out into the sac of the peritonæum. A case is related where the small intestines were perforated, and several, where the perforation was in the rectum, which portion of the intestines, as well as the duodenum, jejunum, and ilium, was also extensively ulcerated.

323. The existence of the *verdigris* in the form of powder, lining the inside of the stomach after incessant vomiting for three days, is of course an important circumstance in the inspection of the body. But too much reliance ought not to be placed on mere bluish or greenish coloring of the

membranes. For it has been observed, that the inside of the stomach as well as its contents may acquire these tints in a very remarkable degree in consequence of natural disease.

SECT. IV.—*Of Poisoning with Antimony.*

1. *Of the Action of Antimony, and the Pathological Symptoms it excites in Man.*

324. Poisoning with antimonial preparations,* is not very common. In large doses some of them may cause death; and one of them, the *butter of antimony*, is a violent corrosive.

325. When *tartar emetic* has been swallowed by man, it generally causes vomiting very soon and is all discharged; and then no other effect follows. But if it remains long in the stomach before it excites vomiting, or if the dose be large, more permanent symptoms are sometimes induced. The vomiting recurs frequently, and is attended with burning pain in the pit of the stomach, and followed by purging and colic pains. There is

---

* The pharmaceutical preparations of antimony, besides the butter of antimony, and tartar emetic, mentioned in the text, are, the oxy-sulphurets of A. (*glass*, *liver*, and *crocus* of antimony,) the hydrated oxy-sulphurets, (*kermes mineral,* and *golden sulphuret of antimony,*) diaphoretic antimony, pulvis antimonialis, (*James' pouders,*) and several liquid preparations of tartar emetic, as antimonial vine, vomitive draught, called holy water, of the French pharmacopæia, vomi-purgative of Le Roy, &c. Metallic antimony exerts no action on the animal œconomy.

also sometimes a sense of tightness in the throat, which may be so great as to prevent swallowing.—The patient is likewise tormented with violent cramps.

326. There is little peculiarity in what is so far known of the symptoms of poisoning with *tartar emetic* in man. *Magendie* found that dogs, like man, may take a large dose with impunity, for example half an ounce, if they are allowed to vomit; but if the gullet is tied, from four to eight grains will kill them in a few hours. From various experiments it has been inferred that tartar emetic occasions death when swallowed, not by inflaming the stomach, but through means of a general inflammatory state of the whole system subsequent to its absorption—of which disorder the affection of the stomach and intestines and that of the lungs are merely parts or symptoms.

327. In whatever way this poison enters the body, its effects are nearly the same. A scruple dissolved in twelve parts of water and injected into the windpipe, caused violent vomiting, difficult breathing, and death in three days. When applied to a wound it acts with almost equal energy as when injected into a vein.

328. The effects of tartar emetic on the skin are worthy of notice; but they have not yet been carefully studied. Some facts tend to show that even its constitutional action may be developed through the skin. Sometimes it has appeared to cause severe symptoms of irritant poisoning when used in the form of ointment to excite a pustular eruption.

A case is reported in which the external use of tartar emetic ointment is supposed to have been the cause of death, in an infant two years old. But doubts may be entertained, whether the irritant symptoms in the one case, and the child's death in the other, were occasioned in the way supposed.

329. Although the constitutional action of tartar emetic is not easily developed through the sound skin, its local effects are severe and unequivocal. When applied to the skin it does not corrode, but excites inflammation. It does not blister; but after being a few days applied, it brings out a number of painful pustules; if it be persevered in, the skin ulcerates; and if it be applied to an ulcerated surface it causes profuse suppuration, and sometimes, even sloughing.

2. *Of the Treatment of Poisoning with Antimony.*

330. The treatment of poisoning by tartar emetic is simple.—If vomiting has not taken place before the physician reaches the patient, he should make him swallow large draughts of warm water, and tickle the throat. But, while that is doing, he should also prepare, without loss of time, some vegetable decoction, which possesses the power of decomposing the poison; and none is better or more likely to be at hand than a decoction of *bark*, particularly yellow-bark.* The tincture is also a good form for administering this antidote.

---

* Oak bark may be used as a substitute for Peruvian bark, when the latter is not at hand; an infusion of green tea would likewise answer a good purpose.

331. The administration of bark has been found useful even after vomiting has continued for some length of time, probably, because a part of the poison has notwithstanding remained undischarged. Before the decoction is ready it is useful to administer the *bark in powder*.

332. When there is reason to believe that the patient has vomited enough, and that a sufficient quantity of the bark has been taken, *opium* is evidently indicated and has been found useful; but *venesection* may be rendered previously necessary if the signs of inflammation in the stomach are obstinate.

3. *Of the Morbid Appearances produced by Antimony.*

333. The morbid appearances caused by tartar emetic have not been often witnessed in man.—In one case, there were some equivocal signs of reaction in the *brain*. The organs in the chest were healthy. The *villous coat of the stomach*, except near the gullet, where it was healthy, was every where red, thickened, and covered with tough mucus. The *duodenum* was in the same state as the stomach; but the other intestines were in their natural condition. In another case, the villous coat of the stomach had a deep reddish-violet color with cherry-red spots interspersed; and the whole small intestines were of a rose-red tint, spotted with cherry-red.

SECT. V. *Of Poisoning with Tin.*

334. The *protomuriate* and *permuriate* of *tin*, when swallowed or applied outwardly, act as local irritants. The *oxide* of tin is also poisonous when swallowed, but is not so active as the muriates. The *metal* has been found to be inactive.*

335. Little need be said of the morbid appearances. Besides the signs of violent irritation caused by the poisons of tin in common with other irritants, *Orfila*, always found in dogs a peculiar tanned appearance of the villous coat of the stomach.

SECT. VI. *Of Poisoning with Silver.*

336. *Nitrate* of *silver* does not act remotely, but simply as a local irritant and corrosive; the corrosion it produces is incompatible with its absorption.

337. The *treatment* of poisoning with the nitrate of silver is obvious. The muriate of soda† by decomposing it will act as an antidote, and any signs of irritation left will be subdued by opium, and antiphlogistic remedies.

---

* The powdered metallic tin, (*pulvis stanni*,) has been administered as an anthelmintic; but as in the preparation of this powder it frequently happens that a slight oxidation takes place, it thus become poisonous. Orfila has recommended *milk*, as an antidote to poisoning with the preparations of tin which, he says, exerts on them a chemical action.

† The salt and water must be administered as soon as possible.

SECT. VII. *Of Poisoning with Gold.*

338. The poisonous properties of the *muriate of gold* are powerful, and closely allied to those of the muriates of tin and nitrate of silver. The muriate of gold, when injected into the veins, even in very minute doses, occasions death in three or four minutes; and the lungs are found after death so turgid as to sink in water. But if swallowed, corrosion takes place; the salt is so rapidly decomposed, that none is taken up by the absorbents; and death ensues simply from the local injury.

339. In the form of *fulminating gold*,* this metal has given rise to some cases of alarming poisoning, when it used to be employed in medicine. It excites griping, diarrhœa, vomiting, fainting, salivation; and has proved fatal.

SECT. VIII. *Of Poisoning with Bismuth.*

340. Bismuth, in its saline combinations, is an active poison.† The following is a reported case of poisoning with a preparation of bismuth in the human subject. A man subject to water-brash, took two drachms of the *subnitrate*, with a little cream of tartar by mistake, for a mixture of chalk and magnesia. He was immediately attacked with

---

* Fulminating gold is an *aurate* of ammonia, according to M. Pelletier.

† The preparations of bismuth found in the shops are, subnitrate of bismuth, (*magistery of bismuth*,) chloride of bismuth, (*butter of bismuth*,) and tartrate of bismuth, (*pearl white*.) Metallic bismuth is inert.

burning in the throat, brown vomiting, watery purging, cramps and coldness of the limbs, and intermitting pulse—then with inflammation of the throat, difficult swallowing, dryness of the membrane of the nose, and a constant nauseous metallic taste—on the third day with hiccup, laborious breathing and swelling of the hands and face, together with suppression of urine, which was then discovered to have existed from the first. On the fourth day swelling and tension of the belly were added to the pre-existing symptoms, on the fifth day salivation, on the sixth delirium, on the seventh swelling of the tongue and enormous enlargement of the belly; and on the ninth he expired. The urine continued suppressed till the eighth day.*

341. On inspection of the body it was found that from the back of the mouth to the rectum, there were but few points of the alimentary canal free of disease. The *tonsils*, *uvula*, *pharynx*, *epiglottis* and *larynx* were gangrenous, the *gullet* livid, the *stomach* very red, with numerous purple pimples, the whole *intestinal canal* red, and here and there gangrenous, especially at the rectum. The inner surface of the *heart* was red. The *kidneys* and *brain* were healthy.

---

* *Treatment of Poisoning with Bismuth.*—Milk, and sweet mucilaginous drinks, are said by Orfila, to be administered with success in cases of poisoning with the preparations of bismuth. Leeches, general bleedings, glysters, and fomentations are recommended, when the symptoms indicate inflammation of one or more organs.

SECT. IX. *Of Poisoning with Chromium.*

342. The *chromate* of *potassa* in the dose of a grain was found to have no effect when injected into the jugular vein of a dog—four grains produced constant vomiting, and death in six days without any other striking symptoms—and ten grains caused instant death by paralyzing the heart.

343. Its effects when introduced under the skin, are still more remarkable. It seems to cause general inflammation of the lining membrane of the air passages. When a drachm was thrust in the state of powder under the skin of the neck of a dog, the first symptoms were weariness and a disinclination to eat. But on the second day the animal vomited, and a purulent matter was discharged from the eyes. On the third day it became palsied in the hind-legs; on the fourth it could not breathe or swallow, but with great difficulty; and on the sixth it died. The wound was not much inflamed; but the larynx, bronchi, and minute ramifications of the air tubes contained fragments of fibrinous effusion, the nostrils were full of similar matter, and the conjunctiva of the eyes were covered with mucus. In another dog, an eruption appeared on the back, and the hair fell off.

344. To these facts may be added another not less singular, observed by workmen who use the *bichromate* of potassa in dyeing. The workmen, who have their hands often immersed in its solu-

tion, are frequently attacked with troublesome sores on the parts touched by it; and the sores gradually extend deeper and deeper, without spreading, till they sometimes actually make their way through the arm or hand altogether.

345. When swallowed, the salts of chrome cause inflammation, but not of a violent kind.*

---

* The chromates of potassa are extensively manufactured in Baltimore, where several cases of poisoning with the saturated liquor of the bichromate have occurred. The following instance has been communicated by Dr. M. Baer:—A laborer, aged thirty-five years, on attempting to draw off from a refiner a solution of the bichromate of potassa, in the effort to exhaust the syphon by suction, received a small quantity of the solution in his mouth. His first impression was, that he had spit it out; but only a few moments elapsed when he was seized with great heat in the throat and stomach, and violent vomiting of blood and mucus. The vomiting continued until shortly before his death, which took place about five hours after the accident. No medical treatment was attempted, Dr. B. having been called in too late. In the post-mortem examination, the mucous tissues of the stomach, duodenum, and about one-fifth of the jejunum, were found destroyed in patches. The remaining parts could be easily removed with the handle of the scalpel. The lower part of the intestinal tube appeared to be healthy.

In reference to the effects of bichromate of potassa as stated, (344,) Dr. Baer informs us, that he has had them confirmed in about twenty cases; that is, wherever there was the slightest abrasion of the cuticle, the solution of bichromate of potassa would produce a painful burrowing ulcer, which would continue in despite of all treatment even to penetrate the limb, unless the workman was removed from the "chromate room." Dr. B. remarks, that he saw ulcers situated on

SECT. X. *Of Poisoning with Zinc.*

346. The effects of the preparations of zinc on man, when given in large doses have not been particularly studied.* In the dose of a scruple or a drachm, the *sulphate* is the most immediate emetic we possess; and it is to be inferred, that if larger doses are rejected, as is the fact, with equal rapidity, they will in general, cause no more harm than the medicinal dose.

347. Nevertheless, some people have suffered severely from over doses of the sulphate of zinc, and a few have even perished. An instance is re-

---

parts of the body, where he is sure the solution did not come in contact. He thinks it probable, that they were produced by vapors charged with chromic acid. The most concentrated form of the solution, however, made no impression upon parts where the cuticle was in a state of integrity.

It is more than probable that in the cases reported above, the injury was produced by the *free chromic acid* contained in the solution. The neutral chromate of potassa will, it is presumed, induce but slight inflammation. The bichromate, on the contrary, would doubtless cause symptoms of a much more violent kind. These remarks are applicable to the compounds of chromic acid and soda.

Treatment of Poisoning with the Bichromates. The first indication in cases of poisoning with these salts, is to administer a solution of carbonate of soda, which will neutralize any free acid present, and to which the injury may be ascribed.

* The preparations of zinc found in the shops are, oxide of zinc, (*flores zinci, philosopher's wool,*) sulphate of zinc, (*white vitriol,*) and acetate of zinc, which is used as an astringent collyrium.

lated, in which about two ounces in solution were swallowed by mistake. The countenance became immediately pale, the extremities cold, the eyes dull, the pulse fluttering. The patient, a young lady, then complained of a burning pain in the stomach, and vomited violently. But potassa being now administered in syrup, the pain ceased, the vomiting gradually abated, and the lady soon recovered completely.

348. It does not appear that workmen who are exposed to the fumes of zinc ever suffer materially. But a case is related which shows that these fumes are not quite harmless. An apothecary's assistant, while preparing *philosopher's wool*, incautiously filled the whole laboratory with it. The same day he was seized with tightness in the chest, headach, and giddiness; next morning with violent cough, vomiting, and stiffness of the limbs; on the third day with a coppery taste in the mouth, some salivation, gripes, and such an increase of giddiness that he could not stand. He was then freely purged, after which a fever set in, ending in perspiration; and he got well in three weeks.

349. The *morbid appearances* after poisoning with sulphate of zinc, taken internally, have been described as follows: The stomach and intestines, but particularly the intestines, were found contracted—their outer surface healthy—the inner membrane of the stomach grayish-green, with several spots of effused blood, and greenish, fluid contents—the inner membrane of the small intes-

tines similarly spotted—the rest of the body quite natural. The poison was detected in the body, not only in the contents, but likewise in the coats of the stomach and intestines.

350. *Treatment of poisoning with sulphate of zinc.*[*]

SECT. XI. *Of Poisoning with Lead.*[†]

1. *Of the action of Lead, and the Pathological Symptoms it excites in Man.*

351. The symptoms observed in man from the preparations of lead are of three kinds: One class of symptoms indicate inflammation of the alimentary canal; another, spasm of its muscles; and a third, injury of the nervous system, sometimes apoplexy, more commonly palsy, and that almost partial and incomplete. Each of these classes of symptoms may exist independently of the other two; but the two last are more commonly combined.

---

[*] The treatment of poisoning with sulphate of zinc, so far as an antidote is concerned, may be gathered from what is stated in the case described. (347.) The poison is obviously decomposed by the *potassa*, which is converted into the sulphate of that alkali, and an insoluble oxide is precipitated.—*Albumen* and *milk* act likewise on the sulphate of zinc precisely in the same manner as on the sulphate of copper. The salt is decomposed, and the metallic oxide forms an insoluble compound with the animal matter: hence these substances may also be used as *antidotes.*

[†] See Appendix B.

352. *The acetate of lead*, in over doses,* will produce violent and immediate effects. The symptoms are either those of simple irritation, or more commonly, those of inflammation united with the peculiar spasmodic colic of lead, and sometimes followed by convulsions and coma, or by local palsy.

353. When introduced into the body continuously and insiduously in minute quantities, the disease which is thus induced may be divided into two distinct stages.

354. The first stage is an affection of the alimentary canal, the leading feature of which is violent and obstinate colic. This symptom at times begins abruptly during a state of sound health; but more commonly, it is ushered in by a deranged state of the stomach, not unlike common dyspepsia, seldom so severe as to cause alarm, and almost always imputed at first to a wrong cause. By and by the uneasiness, which was confined to the stomach, stretches throughout the whole abdomen. At the

---

* The preparations of lead in most common use, are, the oxides of lead, (*litharge* and *red lead*,) iodide of lead, carbonate of lead, (*cerussa, white lead*,) and acetate of lead, (*sugar of lead, Goulard's extract*.) Metallic lead is not poisonous; but as it is scarcely ever free from the carbonate, it may prove deleterious; moreover, when pieces of pure lead have been swallowed by accident, they may meet with acids in the stomach or bowels, which will render them poisonous. Dr. Thomson asserts that the carbonate is the only direct poison of lead.—See Elements of Materia Medica and Therapeutics, by Dr. A. T. Thomson, vol. ii. p. 72.

same time the stomach becomes irritable, and the food is rejected by vomiting. Cramps in the pit of the stomach then succeed, and ere long they extend to the rest of the belly, till at length the complete colic paroxysm is formed. The pain is sometimes pretty constant; sometimes it ceases at intervals altogether; but much more commonly, there are remissions rather than intermissions; and it is remarked that both the remissions and exacerbations are much longer than those of common colic. The pain is very generally, yet not invariably, relieved by pressure; even strong pressure very seldom causes any uneasiness, provided it is not made on the epigastrium; nay, some patients have been known to bear, with relief to the paroxysms, the weight of two or three people standing on the belly. The belly is almost always hard, the abdominal muscles being contracted: sometimes it is rather full, more commonly the reverse; and the navel is often drawn in so as almost to touch the spine. The bowels all the while are obstinately costive: either there is no discharge from them at all, or scanty, knotty fæces are passed with much straining and pain. In a few instances diarrhœa takes the place of the opposite affection. The urine is commonly diminished, but the saliva increased in quantity and bluish in color. From the beginning, or more generally after a few hours or days, the limbs are racked with cutting pains. The aspect of the countenance is dull, anxious, and gloomy: in advanced cases the expression of gloomy anxiety exceeds that of almost all other diseases. Fever is not essentially present. The skin has a dull, dirty, cadaverous appearance, is often, though not always, hot, and in either case is bedewed with irregular, clammy, cold perspiration.

355. This, the first stage of colica pictonum, may end in three ways. In the first place, the patient may recover at once from it, as from an ordinary colic; and it is consolatory to know, that a first attack, taken under timely management, is for the most part easily made to terminate in this favorable manner. In such circumstances it rarely endures beyond eight days. But it is exceedingly apt to recur, if, for example, the patient exposes himself to what, in ordinary circumstances, would cause merely a common colic or diarrhœa; and if he returns to a trade which exposes him again to the poison of lead, the disease is sure to recur sooner or later, and repeatedly, unless he observes the greatest precautions. In one or other of these returns, sometimes even in the first attack, the colic is not succeeded by complete recovery, but gives place to another more obstinate and more alarming disease. This secondary affection is of two sorts: One, which occurs chiefly in fatal cases, is a species of apoplexy. The other, which does not of itself prove fatal, is partial palsy.

356. In violent and neglected cases of colica pictonum, the colic is attended, after a few days, with giddiness, great debility, and torpor; as the

torpor advances, the pains in the belly and limbs abate; at length the patient becomes convulsed and comatose, from which state very few recover. A very rare termination, allied to that now described is sudden death during the colic stage, without any symptoms which would lead any one to suspect its approach.

357. In cases, on the other hand, which have not been neglected, and particularly when the attack is not the first, the departure of the colic often leaves the patient in a state of extreme debility, which by and by is found to be a true partial palsy, more or less complete. This affection is sometimes present before the colic departs, but is apt to escape notice till the pain abates.

358. The palsy is of a peculiar kind. It effects chiefly the upper extremities, and is attended with excessive muscular emaciation. The loss of power and substance is most remarkable in the muscles which supply the thumb and fingers; and generally the extensors suffer more than the flexors. The paralysis is hardly ever complete, except perhaps in the extensors of the fingers. When it is considerable, the position of the hands is almost characteristic of the disease. The hands are constantly bent, except when the arms hang straight down by the side; they dangle loose when the patient moves; he cannot extend them, and raises one arm with the aid of the other. When in this state he usually complains also of racking pains in the limbs and arms; his digestion is feeble, and trivial

causes renew the colic. From this deplorable condition it is still possible to restore him to health, chiefly by rigorous attention to regimen. But he too often dies in consequence of a fresh attack of colic, as soon as he returns to his fatal trade.*—The lead palsy, however, does not always come on in this regular manner. Sometimes the primary stage of colic is wanting, so that the wasting of the muscles and loss of power are the first symptoms.

359. In whatever form lead is habitually applied to the body, it is apt to bring on the train of symptoms mentioned above;—the inhalation of its fumes, the habitual contact of any of its compounds with the skin, the prolonged use of them internally as medicines, or externally as unguents and lotions, and the accidental introduction of them for a length of time, with the food, may, sooner or later, equally induce colica pictonum.

2. *Treatment of Poisoning with Lead.*

360. For the irritant form of poisoning, a safe and effectual antidote exists in any of the soluble alkaline or earthy *sulphates*.† If none of these is at hand, then the *alkaline carbonates* may be

---

* See Appendix B.

† The *sulphate of magnesia*, in the dose of three or four drachms to a pint of water, is the best remedy that can be administered. It acts by decomposing the acetate of lead in the stomach, and transforms it into an insoluble sulphate of lead, an acetate of magnesia being, on the other hand, produced, which operates as an aperient.

given, particularly the bicarbonates, which are not so irritating as the carbonates. The *phosphate of soda* is also an excellent antidote. If the patient does not vomit, it will be right also to give an emetic of the sulphate of zinc. In other respects, the treatment does not differ from that of poisoning with the irritants generally.

361. Colica pictonum is usually treated with success by the conjunction of purgatives with anodynes. A full dose of a neutral laxative salt is given, and an hour afterwards a full dose of opium. Sometimes alvine discharges take place before the opium acts, more commonly not till its action is past, and occasionally not for a considerable time afterwards. But the pain and vomiting subside, the restlessness and irritability pass away, and the bowels return nearly or entirely to their natural condition. Sometimes it is necessary to repeat the practice. It is almost always successful. The second dose seldom fails to remove the colic, leaving the bowels at worst in a state of constipation. When the pulse is full and strong, venesection has been premised with apparent advantage; in some instances it appears to be called for by the flushing of the face and the violence of the spasms.

362. Salivation by mercury in the primary stage of this disease, has been often used with success, the colic yielding as soon as the ptyalism begins. If the case, however, is severe, there is no time to

lose in waiting for the action of the mercury to commence.

363. The treatment in the advanced period of the disease, when the palsy is the chief symptom remaining, depends almost entirely on regimen.—The patient must, for a time at least, quit altogether his unlucky trade. He should be allowed the most generous food he can digest. He ought to take frequent gentle exercise in the air, but never to fatigue. The hands being the most severely injured of the affected parts, and at the same time the most important to the workmen, the practitioner's attention should be directed peculiarly to the restoration of the muscular power. This appears to be most easily brought about by frictions, electricity, and regulated exercise, the hands being also supported in the intervals by splints, extending from the elbows to the fingers.* The dragging of the emaciated muscles by the weight of the dangling hands certainly seems to retard their recovery.†

3. *Of the Morbid Appearances caused by Lead.*

364. The morbid appearances caused by poisoning with lead are in some respects peculiar. In a

---

* Our colleague, Dr. E. Geddings, Professor of Anatomy and Physiology in the University of Maryland, informs us that he has employed strychnia under these circumstances with almost constant success. He also refers us to the observations of Andral, which are highly favorable to the use of this agent in lead paralysis.

† For the prophylaxis, or mode of preventing the influence of the poison, see Appendix B.

case reported of the *human subject*, the lower end of the *gullet*, the whole *stomach* and *duodenum*, a part of the *jejunum*, and the ascending and transverse colon were greatly inflamed; and the villous coat of the stomach appeared as if it had been macerated. The stomach contained six ounces of a reddish brown fluid which had a sweetish, styptic, metallic taste, exhaled the odor of vinegar while evaporating, and yielded globules of lead when the dry residue was subjected to the process of reduction.*

365. *In animals*, when the quantity of the sugar of lead has been large, the stomach instead of being red, has sometimes a peculiar blanched appearance, supposed to arise from some chemical action. The *blood* seems to be sometimes altered in nature: it has been found fluid. In a dog poisoned with litharge, the blood was found of a vermilion color in the veins, and brighter than usual in the arteries.

366. The appearances found in the bodies of those who have died of the various forms of lead colic are different, and wholly unconnected with inflammation.

367. In the acute or comatose form of colica pictonum, the bodies were plump, muscular and fat.

---

* Dr. Christison remarks, that the detection of lead in the stomach after the patient survived nearly three days, as on this occasion, is an important fact in medico-legal chemistry. It is to be regretted that the dose of the poison, which in this case was *Goulard's extract*, could not be ascertained.

The alimentary canal was quite empty, and the colon much contracted—in one instance to an extraordinary degree. The mucous coat of the alimentary canal was every where healthy.

368. The appearances in those who have been long affected with a paralytic form have been rarely observed. In one case of a man, who had been long and frequently afflicted with colica pictonum and its sequelæ, the intestines were dark, tender, and far advanced in putrefaction. The cardiac orifice of the stomach was so narrow that it would only admit a goose-quil. The mesenteric glands were enlarged and hardened. The thoracic duct was surrounded by many large bodies, like diseased glands, exactly of the color of lead, and composed of organic cysts containing apparently an inorganic matter.* The muscles in similar circumstances are much diseased.

369. When the paralysis is not of long standing, the whole muscular system becomes pale, bloodless and flacid.

370. When the palsy is of long standing, this change increases so much, that the muscles in some parts, as in the arms and thumbs, acquire the color and general aspect of white fibrous tissue.

Sect. XII.—*Of Poisoning with Barium.*

1. *Of the Action of the Barytic Salts, and the Pathological Symptoms they excite in Man.*

371. The action of the salts of baryta on the

---

* "The analysis of the matter was unfortunately neglected."

body is energetic. Like most metallic poisons, they seem to possess a two-fold action,—one local and irritating, the other remote and indicated by narcotic symptoms. This narcotic action is more decided and invariable than in the instance of any of the metallic poisons hitherto noticed.

372. The symptoms produced by the salts of baryta *in man*, have not yet been particularly described. An instance is noticed where an ounce of the muriate proved fatal. The patient immediately after swallowing it, felt a sense of burning in the stomach; vomiting, convulsions, headach, and deafness ensued; and death took place within an hour.

373. Unpleasant effects have also been observed from two large doses administered medicinally. A case is mentioned of a gentleman who was directed to take sixteen drops of a solution as a stomachic, but swallowed one evening, by accident, seventy or eighty drops. He had soon after profuse purging, without tormina, then vomiting, and half an hour after swallowing the salt, excessive muscular debility, amounting to absolute paraplegia of the limbs. This state lasted about twenty-four hours, and then gradually went off. Violent vomiting, gripes, and diarrhœa are known to have been produced in like manner, by a quantity not much exceeding the usual medicinal dose.

2. *Of the Treatment of Poisoning with the Salts of Baryta.*

374. The treatment of this variety of poisoning

consists chiefly in the speedy administration of some alkaline or earthy sulphate, such as the *sulphate of soda* or *sulphate of magnesia.* The poison is thus immediately converted into the insoluble sulphate of baryta, which is quite inert.*

3. *Of the Morbid Appearances caused by the Salts of Baryta.*

375. No account has yet been published of the morbid appearances as they occur in man.

376. In *animals*, the mucous membane of the stomach is usually found of a deep-red color, unless death takes place with great rapidity, in which case the alimentary canal is healthy. In animals killed by the application of the hydro-chlorate to wounds, the brain and its membranes were much injected with blood; and in one the appearances were precisely those of congestive apoplexy.

SECT. XIII. *Of Poisoning with Strontium.*

377. The salts of strontia are very feebly poisonous.—Ten grains of the muriate in solution had no effect when injected into the jugular vein of a dog—two drachms had no effect when introduced into the stomach of a rabbit—half an ounce was required to cause death in that way—two drachms of the carbonate had no effect—and two drachms

---

* The *alkaline phosphates* likewise decompose muriate of baryta, and an insoluble phosphate is formed, which exerts no influence on the animal body; these, and tannin, may also be administered as antidotes in poisoning with this salt.

of the nitrate, dissolved in six parts of water and given to a rabbit, merely caused increase of the frequency and hardness of the pulse, and brisk diarrhœa.

SECT. XIV. *Of Poisoning with Osmium, Platinum, Iridium, Rhodium and Palladium.*

378. Oxide of *osmium* is nearly as active as arsenic; for a grain and a half will kill a dog in a few hours by the stomach, and in one hour through a vein.

379. Twelve grains of muriate of *platinum* will kill a dog within a day through the stomach, with symptoms of pure irritation; and so will half that quantity through a vein.

380. The muriates of *iridium* and *rhodium* are rather less active than the muriate of platinum.

381. The muriate of *palladium* is equally powerful as that of platinum when introduced into the stomach, and much more so through a vein, for two-thirds of a grain will kill dogs in a minute.

SECT. XV. *Of Poisoning with Molybdenum, Manganese, Uranium and Cobalt.*

382. *Molybdenum*, in the form of *molybdate* of *ammonia*, seems a feeble poison; thirty grains killed a rabbit in two hours, but produced in dogs merely some vomiting and purging, and ten grains injected into the jugular vein did not prove fatal.

383. *Manganese* is likewise a feeble poison, but has peculiar effects. A drachm of the *sulphate* killed

a rabbit in an hour. Thirty grains swallowed by a dog had no effect. Two drachms thrust into the cellular tissue had no effect. Twelve grains injected into a vein occasioned death in five days; and in the dead body, the stomach, duodenum, and liver were found much inflamed. The *manganesic acid* appears also to act on the liver, but is a feeble poison. A rabbit received two drachms in three days, in doses of ten or fifteen grains, without presenting any symptom, except increased flow of urine. Being then killed, the liver was found soft, at one part bright-red, elsewhere dark-brownish-red, and it yielded manganese by incineration.

384. *Uranium* is an active poison when injected into a vein, for three grains of the muriate proves fatal instantly; but dogs may swallow fifteen, or from that to sixty grains without any other effect except slight vomiting.

385. *Cobalt* is more active.* Thirty grains of the *oxide* occasions death in a few hours through the stomach. Twenty-four grains of the muriate applied to the cellular tissue excite vomiting. Three grains of *sulphate* injected into a vien prove fatal in four days.

SECT. XVI. *Of Poisoning with Tungsten, Cerium, Cadmium, Nickel and Titanium.*

386. *Tungstate* of *ammonia* in the dose of a drachm had no effect when swallowed by a dog;

---

* The mineral sold in the shops under the name of cobalt, or fly-stone, is actually an ore of *arsenic*, containing cobalt, iron, and impurities.

forty grains of *tungstate* of *soda*, which is more soluble, operates as an emetic; but this dose will prove fatal to rabbits in a few hours.

387. A drachm of the muriate of *cerium* had little or no effect on a dog, and half that dose had no effect on a rabbit.

388. The *oxide* of *cadmium* in the dose of twenty grains made a dog vomit; and ten grains had no effect at all.

389. Twenty grains of *sulphate* of *nickel* made a dog vomit; forty grains applied to the cellular tissue had no effect at all on the general constitution; but ten grains injected into the jugular vein occasioned immediate death.

390. A drachm of *titanic acid* had no effect on a dog.

Sect. XVII. *Of Poisoning with Iron.*

391. The preparations of iron, though not usually considered poisonous, will nevertheless, when taken in large quantities, sometimes prove injurious, and even occasion all the chief symptoms of the active irritants.

392. Two drachms of the *sulphate of iron* will sometimes prove fatal to dogs, either when administered internally, or when applied to a wound; and it has likewise been known to act injuriously on the human subject.—A case is related of a girl, who took as an emmenagogue an ounce of the *sulphate* dissolved in beer, and who was seized in consequence with colic pains, constant vomiting,

and purging for seven hours. *Mucilaginous and oily drinks soon cured her.*

393. The *muriate* of *iron* is probably a more active compound; but its activity is chiefly owing to the excess of acid, which the preparation of the shops contains.* The following case is related.—A gardener swallowed one morning about an ounce and a half of the tincture of muriate of iron instead of whiskey. Violent pain in the throat and stomach, tension and contraction of the epigastrium, and nausea immediately ensued; afterwards, coldness of the skin, and feebleness of the pulse were remarked; and then vomiting of an inky fluid, with subsequently profuse vomiting of mucus and blood, and also bloody stools under the use of laxatives. For some days he was in a very precarious state, but he then began to rally, and in three weeks resumed his occupation. In two weeks more, however, his physician found him emaciated, cadaverous in appearance, and laboring under pains in the stomach, costiveness and thirst; in which state he lingered for five days more, when he died.

394. In the dead body there was found great thickening towards the pylorus—a cicatrised patch there three inches long and two inches broad—and another large patch of inflammatory redness surrounded by a white border.

---

* A solution of carbonate of soda would probably prove the best remedy to be immediately resorted to in case of taking too large a quantity of the *tinctures* of *iron*, ordinarily employed as diffusible tonics.

CHAPTER IX.

CLASS FIRST.—ORDER FIFTH.

395. THE fifth order of the first class of poisons embraces the vegetable and animal irritants.

396. This order may be divided into two groups. The first group containing a great number of genera, derived from the vegetable kingdom, and formerly arranged in a class by themselves, under the title of acrid poisons, and including many plants of the natural families *ranunculaceæ* and *cucurbitaceæ*, several of the family of *tithymaloidæ*, and other plants scattered throughout the bontanical system.—The second group consists of some acrid poisons from the animal kingdom, namely, *cantharides*, *poisonous fishes*, *poisonous serpents*, and animal matters become poisonous by *disease* or *putrefaction*.

GROUP FIRST.

OF POISONING WITH THE VEGETABLE ACRIDS.

1. *Of the Mode of Action of the Vegetable Acrids, and the Pathological Symptoms they excite in Man.*

397. The poisonous properties of the plants of this order are found to be concentrated in certain

principles which exist in them. Some of these principles appear to act through the medium of the blood. But many plants of this order, as well as their active principles, have a totally different and very peculiar action. They produce violent spreading inflammation of the subcutaneous cellular tissue, and acute inflammation of the stomach and intestines without entering the blood; and death is the consequence of a sympathy of remote organs with the parts directly injured.

398. The symptoms occasioned in man by the irritant poisons of the vegetable kingdom, are chiefly those indicating inflammation of the villous coat of the stomach and intestines. When taken in large doses, they excite vomiting soon after they are swallowed; by which means, the patient's life is often saved. But sometimes like the mineral poisons that possess emetic properties, the vegetable acrids show a singular caprice in this respect: they may be retained without much inconvenience for some length of time. If this should happen, or if the dose be less, in which case vomiting may not be produced at all, or if the greater part of a large dose be discharged at an early period by vomiting, the other phenomena they give rise to are sometimes fully developed. The most conspicuous symptom then is diarrhœa, more or less profuse.

399. The diarrhœa and vomiting are commonly attended by twisting pain of the belly, at first remittent, but becoming gradually more constant, as

the inflammation is more and more strongly marked. Tension, fullness and tenderness of the belly, are then not unfrequent. The stools may assume all the characters of the discharges in natural inflammation of the intestinal mucous membrane; but an additional character worthy of notice is the appearance of fragments of leaves or flowers belonging to the plant which has been swallowed. At the same time, there is generally excessive weakness. Sometimes, too, giddiness and a tendency to delirium have been observed. But the latter symptoms are rare.

2. *Of the Morbid Appearances caused by the Vegetable Acrids.*

400. The morbid appearances which the vegetable acrids leave in the dead body, are: more or less redness of the stomach, ulceration of its villous coat, redness of the intestines, and especially of the rectum and colon, which are often inflamed when the small intestines are not visibly affected.

Sect. I. *Of Poisoning with the Ranunculaceæ.*

401. The natural family of the Ranunculaceæ abounds in acrid poisons. Indeed few of the genera included in it are without more or less acrid property. This is a good illustration of a general law in nature—that those plants resemble each other most in their effects on the animal system,

which are also the most similar in outward characters.

402. Of the genus *Ranunculus*,* the most common are *R. bulbosus*, *acris*, *sceleratus*, *flammula*, *lingua*, *aquatilis*, *repens*, *ficaria*. The *R. acris* is the only species that has been particularly examined. Two drops of the expressed juice produced burning pain and spasms in the gullet and griping in the lower belly. A single flower had the same effect. The thickest and most succulent of leaves, when chewed, strongly stimulated the salivary glands, the tongue was excoriated and cracked, the teeth smarted, and the gums became tender and bloody. It will blister the skin. All the species of ranunculus are probably endowed with similar properties, especially the *R. sceleratus*.

403. The genus *Anemone* produces similar effects on the animal economy. The powder of the

---

* The popular name for the ranunculus, it is well known, is *crow-foot*. The R. sceleratus is designated as the *celery-leaved crow-foot*, and the R. acris as the *upright* or *double-flowered crow-foot*.

The botanical essential characters of the *Ranunculaceæ* are as follows:—"*Sepals* 3—6, hypogynous, deciduous, generally imbricate is æstivation, occasionally valvate or duplicate. *Petals* 5—15, hypogynous, in one or more rows, distinct, sometimes deformed in correspondence with metamorphosis in the stamens. *Stamens* indefinite in number, hypogynous: *anthers* adnate, in the true genera turned outwards. *Pistilla*, numerous, seated on a torus, one-celled or united into a single many-celled pistillum; *ovarium* one or more seeded, the *ovula* adhering to the inner edge; *style* one to each ovarium, short, simple. *Fruit*, either consisting of dry nuts or caryop-

*A. pulsatilla** causes itching of the eyes, colic and vomiting, if in pulverizing it the operator do not avoid the fine dust which is driven up; and the

sides, or baccate with one or more seeds, or follicular with one or two valves. *Seeds* albuminous; when solitary, either erect or pendulous. *Embryo* minute. *Albumen* corneous.—Herbs, or very rarely *shrubs*. *Leaves* alternate or opposite, generally divided, with the petiole dilated, and forming a sheath half clasping the stem. *Hairs,* if any, simple. *Inflorescence* variable." LINDLEY.

Of the *general properties* which characterise medicinally this family of plants, it has already been stated that they are all more or less acrid and poisonous. These properties, which belong to nearly every part of the plant, seem to be owing in many to the presence of a volatile principle easily destroyed by heat, or simply by the process of desiccation; so that the greater number of the plants belonging to this order, although highly poisonous when fresh, lose their deleterious properties when dried or boiled. In the genus *aconitum*, to which belong the species known popularly by the name of wolf's-bane, monk's-hood, &c., this acrid principle appears to reside in greater abundance in the root, than in the leaves. The seeds of the different genera of plants of this order have likewise more or less of an acrid and bitter taste, which is lodged in the husk, and not in the kernel itself which is frequently sweet and oleaginous. As exposure to heat and air will destroy or remove the poisonous properties of these plants, some of them have been used as food. This is the case with the young shoots of the *clematis vitalba* or traveller's joy, which is much relished by the Piedmontese, and also the leaves of the *ficaria* or *pilewort*, and even those of some species of ranunculus, as the *R. auricomus* or wood crow-foot, the *R. lanuginosus* or woolly-leaved C. &c. But the acrid principle in these plants is found to be increased by acids, sugar, honey and wine, and in fact is effectually destroyed only by water.

* Common pasque-flower.

bruised root used as an external application for rheumatism, has brought on gangrene.

404. The *Caltha palustris*, or marsh marigold, a plant closely allied in external characters to the ranunculus, is a powerful acrid. A case is related of a family of five persons who took the poison accidentally. They were all seized half an hour after eating with sickness, pain in the abdomen, vomiting, headache and ringing in the ears, afterwards with dysuria and diarrhœa, next day with œdema of the whole body, particularly of the face, and on the third day with an eruption of pemphigous vesicles as large as almonds, which dried up in forty-eight hours. They all recovered.

405. The *Delphinium Staphysagria*, or stavesacre, another plant of the same natural family, owes its poisonous properties to the presence of a peculiar alkaloid, named *delphinia*. Six grains of this diffused through water, introduced into the stomach of a dog and retained there with a ligature on the gullet, brought on efforts to vomit, restlessness, giddiness, immobility, slight convulsions, and death in two or three hours. The same quantity if previously dissolved in vinegar, will cause death in forty minutes. In the former case, but not in the latter, the inner coat of the stomach is found to be generally red.—An ounce of bruised seeds themselves killed a dog in fifty-four hours when introduced into the stomach, and two drachms applied to a wound in the thigh, killed another in two days. In the former animal a part of the stomach

was crimson-red, in the latter there was extensive subcutaneous inflammation, reaching as high as the fourth rib.

406. Besides these four genera of the ranunculaceæ, many other genera of the same natural order are equally energetic. The *Chelidonium majus*,* or celandine, often cultivated in gardens, has been proved to possess the poisonous properties of the order. The *Clematis* or traveller's-joy, is also known to be acrid. The *C. flammula*† reddens and blisters the skin, and when swallowed excites inflammation in the stomach. The *Trollius* or globe-flower is also acrid: its root in appearance, smell, and taste, closely resembles that of the black hellebore.‡

SECT. II.—*Of Poisoning with the Cucurbitacæ.*

407. The family of the cucurbitacæ, or *gourds*, does not in general possess poisonous properties. On the contrary, they are with a few exceptions, remarkably mild; and many of them supply articles of luxury for the table.§ The melon, gourd,

---

* The *chelidonium majus* belongs to the order papaveraceæ.

† Sweet-scented virgin's-bower.

‡ Dr. Christison remarks here, that some of the genera of equal power have been usually arranged with the narcotico-acrid poisons on account of their action on the nervous system; and probably some of the present group of acrids might with equal propriety be removed to the same class.

§ The essential characters of the family *cucurbitacæ*, are:—"Flowers, usually diclinous, sometimes monoclinous. *Calyx* five-toothed, sometimes obsolete. *Corolla* five-parted, scarce-

and cucumber belong to this order. The only poisons of the order which have been examined with any care, are bryony, colocynth, and elaterium.

408. The root of the *Bryonia alba*, before it was expelled from medical practice, was often known to produce vomiting, tormina, profuse watery evacuation, and fainting. Half an ounce introduced into the stomach of a dog, killed it in twenty-four hours, when the gullet was tied; and two drachms and a half applied to a wound, brought on violent inflammation and suppuration

ly distinguishable from the calyx, very cellular, with strongly marked reticulated veins, sometimes fringed. *Stamens* five, either distinct, or cohering in three parcels. *Anthers*, two-celled, very strong and sinuous. *Ovarium*, inferior, one-celled, with three parietal placentæ; style short; *stigmas* very thick, velvety or fringed. *Fruit*, fleshy, more or less succulent, crowned by the scar of the calyx, one-celled, with three parietal placentæ. *Seeds* flat, ovate, enveloped in an axillus, which is either juicy, or dry and membranous; *testa* coriaceous, often thick at the margin; *embryo* flat, with no *albumen; cotyledons* foliaceous, veined; *radical* next the hilum. *Roots* annual or perennial, fibrous or tuberous. *Stem*, succulent, climbing by means of tendrils formed by abortive leaves (Stipulæ *St-Hil.*) *Leaves*, palmated, or with palmate ribs, very succulent, covered with numerous asperities. *Flowers*, white, red, or yellow."—Lind. It may be remarked in relation to the general properties of this family of plants, that the seeds of the different species never participate in the property of the pulp that surrounds them. The leaf of the *Feuillea cordifolia* belonging to this family is further asserted by M. Drapiez to be a powerful *antidote* against vegetable poisons generally.

of the part, ending fatally in sixty hours. The root owes its power to an extractive principle, named *byronin*. This principle acts on the stomach and on a wound exactly as the root itself, and is considerably more energetic. When introduced into the cavity of the pleura, it causes rapid death by true pleurisy, ending in the effusion of fibrin.

409. *Colocynth*, or bitter-apple, is another very active and more common acrid, derived from a plant of the same family, the *cucumis colocynthis** Its active principle is probably a resinoid matter, termed *colocynthin*. A considerable number of severe cases of poisoning with this substance have occurred in the human subject. A case is mentioned of a man who was nearly carried off by profuse, bloody diarhœa, in consequence of taking a decoction of three colocynth apples. Another is related of an individual, who, attempting to cure himself of a gonorrhœa, by taking three ounces of colocynth, was seized with vomiting, acute pain in the stomach, profuse diarrhœa, dimness of sight, and slight delirium; *but he recovered under the use of diluents, and local blood-letting*. A case, which proved fatal, is given of a subject who took two glasses of decoction of colocynth to cure hemorr-

---

* The colocynth of the shops is prepared from the pulp of the plant; but, according to Thumberg, the gourd is rendered perfectly mild at the Cape of Good Hope, by a peculiar preparation.

hoids, and was soon after attacked with colic, purging, heat in the belly and dryness of the throat.—Afterwards the belly became tense and excessively tender, and the stools were suppressed altogether. Next morning he had also retention of urine, retraction of the testicles and priapism. On the third day the retention ceased, but the other symptoms continued, and the skin became covered with clammy sweat, which preceded his death only a few hours. The intestines were red, studded with black spots, and matted together by fibrinous matter; the usual fluid of peritonitis was effused into the belly; the villous coat of the stomach was here and there ulcerated; and the liver, kidneys, and bladder also exhibited traces of inflammation.

410. *Elaterium*, which is procured from a third plant of the cucurbitaceæ, the *Momordica elaterium*, or spurting cucumber, possesses precisely the same properties with the two preceding substances. It appears, however, to be more active, for a single grain has been known to act violently on man. The active properties of this substance reside in a peculiar crystalline principle named *elaterin.*[*] It is a poison of very great activity.—A tenth of a grain will sometimes cause purging in man; and a fifth of a grain, in two doses, administered at an interval of twenty-four hours, to a rabbit, killed it in seventeen hours after the second dose.

---

[*] Or elatin.

SECT. III. *Of Poisoning with the Tithymaloidæ.*[*]

411. *Euphorbium*, the inspissated juice of various plants of the genus euphorbia or spurge, contains a variety of principles; but its chief in-

---

[*] The *botanical characters* of the tithymaloidæ (more properly the *Euphorbiaceæ*) are as follows:—"*Flowers* monæcious or diœcious. *Calyx* lobed, inferior, with various glandular or scaly internal appendages; (sometimes wanting.) *Sterile flowers; stamens* definite or indefinite, distinct or monadelphous; *anthers* two-celled. *Fertile flowers; ovarium* superior, sessile or stalked, two, three, or more celled; *ovules* solitary or twin, suspended from the inner angle of the cell; *styles* equal in number to the cells, sometimes distinct, sometimes combined, sometimes none; *stigma* compound, or single with several lobes. *Fruit* consisting of two, three, or more dehiscent cells, separating with elasticity from their common axis. *Seeds* solitary or twin, suspended, with an axillus; *embryo* enclosed in fleshy albumen; *cotyledons* flat; radical superior. *Trees, shrubs*, or *herbaceous plants*, often abounding in acrid milk. *Leaves* opposite or alternate, simple, rarely compound, usually with stipulæ. *Flowers* axillary or terminal, usually with bracteæ, sometimes enclosed within an involucrum."—LIND. It is stated under the head of the medical properties of this family of plants, that there is a gradual and insensible transition, from mere stimulants to the most dangerous poisons. Those genera that are poisonous have usually an acrid character, and some of them are also narcotic. As in the case of the ranunculaceæ, the active principle in some genera of the euphorbiaceæ is of a very volatile nature, the application of heat being sufficient to dissipate it. Thus the root of the *Iathropha manihot* or cassava, which, when raw, is a most violent poison, becomes a wholesome nutritious article of food when roasted. On the other hand, heat, in some, seems to develope the acrid principle. *See note to* 412.

gredient is a resin, in which its active principle resides. The chief symptoms occasioned in man by euporbium, are violent griping and purging, and excessive exhaustion. A fatal case is related, where burning heat in the throat and then in the stomach, vomiting, irregular hurried pulse, and cold perspiration were the leading symptoms; and the person died in three days. Several gangrenous spots were found in the stomach, and its coats tore with the slightest touch. It would appear that when applied in powder to the sound skin, it causes violent heat, itching, and smarting, succeeded by inflammation and blisters. Probably all the species of euphorbium possess the same properties as the *E. officinarum*. The leaves of the *E. cyparissias* and *lathyris* produce precisely the effects described above. The *E. esula* appears to be a very active species.

412. *Castor oil*, at present so extensively used as a mild and effectual laxative, is nevertheless derived from the seed of a plant hardly inferior in activity as a poison to that just considered—the *Ricinus communis* or palma christi. Two or three of the seeds will operate as a violent cathartic.—A case is related of a stout man who was attacked with profuse vomiting and purging, after having masticated a single seed. Another instance is mentioned, where three grains of the fresh seeds, taken by a young woman, caused so violent vomiting, hiccup, pain in the stomach, and faintness,

that for some time her life was considered in great danger.*

413. The plants of the genus *Iatropa*, belonging to the same natural family, have all of them the same acrid properties as the castor oil tree. The seeds of the *I. curcas*, when applied in the form of powder to a wound, produce violent spreading inflammation of the subcutaneous cellular tissue, and when introduced into the stomach they inflame that organ and the intestines. Similar effects are produced by a fixed oil and by a volatile acid of a peculiar nature, which has been procured from these seeds. The oil seems to owe its properties to the acid. When separated by the solvent action of alcohol, the oil is so active that four drops killed a blackbird in less than four and twenty hours; but when saponified by potassa, and then freed of its volatile oil by distillation, it became inert.—The acid, which possesses the peculiar odor of the seed, is still more powerful, a very small quantity having killed a crow almost instantaneously.

---

* The *castor oil* itself becomes altered by heat; and acquires acrid properties. In the East and West Indies the process for extracting the oil is by decoction; it usually consists in bruising the seeds previously deprived of their husk, and then boiling them in water. The oil rises to the surface, is strained off, and again boiled with a small quantity of water to dissipate the acrid principle. But to increase the product, the seeds are sometimes roasted, by which the oil acquires a brownish hue, and an acrid peppery taste. We have known an ordinary dose of such oil to produce violent vomiting, with burning heat in the throat and stomach.

The oil is a powerful rubefacient, and if left too long in contact with the skin, it will even produce a deep slough like the corrosive mineral poisons. The juice of the root of the *I. manihot*, or bitter cassada, is exceedingly acrid; negroes in the West Indies have been killed in an hour by drinking half a pint of it. It is rendered wholesome by a simple process, through means of which the juice is removed, and little else left than fecula.

414. The *Manchineel*, (*Hippomane mancinella*,) another plant of the same natural family, contains a milky juice, which is possessed of very acrid properties. Inflammation is excited wherever the juice is applied even on the sound skin.

SECT. IV. *Of Poisoning with Mezereon.*

415. The *Mezereon*, and several other species of the genus daphne, to which it belongs, are powerfully acrid. They belong to the natural order thymelææ.* The bark of the mezereon contains

---

* The essential characters of the thymelææ are as follows: "*Calyx* inferior, tubular, colored; the limb four-cleft, seldom five cleft; with an imbricated æstivation *Corolla* 0, or sometimes scale-like petals in the orifice of the calyx. *Stamens* definite, inserted in the tube or its orifice, often eight, sometimes four, less frequently two; when equal in number to the segments of the calyx or fewer, opposite to them; *anthers* two-celled, dehiscing lengthwise in the middle. *Ovarium* solitary, with one solitary pendulous ovulum; *style* one; *stigma* undivided. *Fruit* hard, dry, and nut-like, or drupaceous. *Albumen* none, or thin and fleshy; *embryo* straight, inverted; *cotyledons* plano-convex; *radicle* short, superior; *plumula* inconspicuous.

a crystalline principle in which the poisonous properties of the plant probably reside.* Children have been tempted to eat the berries of the *D. mezereon* by their singular beauty, and some have died in consequence. A case is related of a man who took the wood of it for dropsy, and was attacked with profuse diarrhœa and obstinate vomiting, the last of which symptoms recurred occasionally for six weeks. Linnæus mentions a girl who died of excessive vomiting and hæmoptysis, in consequence of taking twelve of the berries to check an ague.†

SECT. V. *Of Poisoning with Daffodil.*

416. The common *Daffodil*, (*Narcissus pseudonarcissus*, though commonly arranged with the vegetable acrids, seems not entitled to a place

---

Stem shrubby, very seldom herbaceous, with tenaceous bark. *Leaves* without stipulæ, alternate or opposite, entire. *Flowers* capitate or spiked, terminal or axillary, occasionally solitary."—R. BR. PRODR. LIND. The great feature of this family of plants, is the causticity of the bark, which acts upon the skin as a vasicatory, and causes excessive pain in the mouth if chewed. The berries of D. laureola, or *spurge laurel*, are poisonous to all animals except birds.

* This proximate principle has been termed daphnina.

† The poisonous properties of Mezereon are further illustrated by the following fact, quoted by Dr. Thomson from Sage: When the French army was in Corsica, the soldiers often dried their meat by smoking it with wood fires; some of them having used the mezereon for this purpose, were attacked with erosions of the mouth, stomach, and intestines, and died in great torture.

among them. The experiments of Orfila rather tend to show that it acts through absorption of the nervous system. Four drachms of the aqueous extract of this plant, secured in the stomach in the usual way, killed a dog in less than twenty-four hours; and one drachm applied to a wound killed another in six hours. In both cases, vomiting, or efforts to vomit, seemed the only symptom of note; and in both, the stomach was found here and there cherry-red. The wound was not much inflamed.

SECT. VI. *Of Poisoning with Jalap.*

417. *Jalap*, the powder of the root of the *Convolvulus jalapa*, and a common purgative, is an active poison in large doses: and this every one should know, as severe and even dangerous effects have followed its incautious use in the hands of the practical joker. Its active properties reside in a particular resinous principle, named *jalapin*. When injected into the jugular vein of a dog in the dose of twenty-four grains, or when applied to the cellular tissue in the dose of a drachm, jalap was found not to produce any particular symptom. But when rubbed daily into the skin of the belly and thighs, it excited, in a few days, severe dysentery; when introduced into the pleura it excited pleurisy, fatal in three days; when introduced into the peritonæum it caused peritonitis and violent dysentery, fatal in six days; and when introduced into the stomach or anus, the animals died of profuse purging in four or five days, and the stomach and in-

testines were then found red, and sometimes ulcerated. Two drachms administered by the mouth proved fatal. *Scammony*, which is procured from another species of the same genus, the *C. Scammonea*, has been found much less active. Four drachms of the concrete juice of the root, given to dogs, produced only diarrhœa.

SECT. VII. *Of Poisoning with Savin.*

418. The leaves of the *Juniperus sabina*, or savin, have been long known to be poisonous.* They yield an essential oil, which possesses all their qualities in an eminent degree. A dog was killed by six drachms of the powdered leaves confined in the stomach. It appeared to suffer pain, died in sixteen hours, and exhibited, on dissection, only trivial redness of the stomach. Two drachms, introduced into a wound of the thigh, caused death after the manner of the other vegetable acrids, in two days; and besides inflammation of the limb, there was found redness of the rectum. An examination of the body of a female, who died after taking a large quantity of a strong infusion of savin leaves to produce a miscarriage, exhibited extensive peritonæal inflammation, unequivocally indicated by the effusion of fibrinous flakes—the uterus presented all the signs of recent delivery—the inside of the stomach of a red tint, checkered with

---

* The *Juniperus Virginiana*, or red cedar, being similar in appearance, taste, and medicinal virtues, to the savin, will probably be found to possess the same toxicological properties.

patches of florid extravasation—and its contents of a greenish color, owing, evidently, to the presence of a vegetable powder, as was proved by separating and examining it with the microscope.*

---

* "The following list," says Dr. Christison, "includes all the other plants which have been either ascertained experimentally to belong to the present order, or are believed, on good general evidence, to possess the same or analogous properties. By careful experiment, Orfila has ascertained that the Gratiola officinalis, Gamboge, Rhus radicans, and Rhus toxicodendron, Sedum acre, and Arum maculatum possess them; and the following species are also generally considered acrid, namely: Rhododendron chrysanthemum and ferrugineum, Pedicularis palustris, Cyclamen Europæum, Plumbago Europæa, Pastinaca sativa, Lobelia syphilitica and longiflora, Hydrocotyle vulgaris, Croton tiglium. To these may be added the common elder, or Sambucus nigra, the leaves and flowers of which caused, in a boy, dangerous inflammation of the mucous membrane of the bowels, lasting for eight days."—Concerning the above mentioned plants, it may be well to add the following brief accounts:

The *Gratiola officinalis,* or hedge hyssop, is a drastic cathartic and emetic, possessing also diuretic properties.

Gamboge, the concrete juice of the Stalagmitis cambogioides, is a powerful drastic, hydragogue cathartic, very apt to produce nausea and vomiting in the dose of from two to six grains.

The *Rhus radicans* and *R. toxicodendron* belong more properly to the class of narcotico-acrid poisons.

The *Sedum acre*, or biting stone-crop, is considered antiscorbutic; its juice applied to the skin blisters it, taken inwardly it vomits, and applied externally to gangrenes it promotes suppuration.

The *Arum maculatum* and *A. triphyllum* are both very acrid plants. The A. triphyllum, *dragon root, indian turnip,* or

Sect. VIII.—*Of Poisoning with Pepper.*

418. bis. *Pepper*, which is daily used by all ranks with impunity, will nevertheless cause even dangerous symptoms when taken in large quanti-

---

wake robin, is common in all parts of the United States. "In the recent state it has a peculiar odor, and is violently acrid, producing, when chewed, an insupportably burning and biting sensation in the mouth and throat, which continues for a long time, and leaves an unpleasant soreness behind. According to Dr. Bigelow, its action does not readily extend through the cuticle, as the bruised root may lie upon the skin till it becomes dry, without producing pain or redness. The acrid principle is extremely volatile, and is entirely driven off by heat. It is not imparted to water, alcohol, ether, or olive oil. The root loses nearly all its acrimony by drying, and in a short time becomes quite inert. In its recent state it is a powerful local irritant, possessing the property of stimulating the secretions, particularly those of the skin and lungs."—*U. S. Dispensatory.*

For the properties of *Rhododendron chrysanthemum* and *rrugineum*, see note to (579.)

The *Plumbago Europœa* is called the toothwort, being frequently used for curing the tooth-ache, which it sometimes does by exciting a healthy salivation.

Pastinaca sativa is the common *parsnip.*

The *Lobeliœ* belong more properly to the class of narcotico-acrids.

The *Croton Tiglium* is a native of India. "The tree is pervaded throughout by an acrid purgative principle, which is probably analagous to that found in other plants belonging to the family of the Euphorbiaceæ. The root is a drastic purge; and the leaves are so acrid, that when chewed and swallowed they excite painful inflammation in the lips, mouth, throat, and along the whole course of the alimentary canal. The wood ty. In Rusts' Journal is noticed the case of a man affected with a tertian ague, who took between one and a half or two ounces of pepper, in brandy, and who was attacked with convulsions, burning in the throat and stomach, great thirst and vomiting of every thing he swallowed. His case was treated as one of simple gastritis, and he recovered.*

---

is, in small doses, diaphoretic, in larger, purgative and emetic. But the seeds are the portion in which the active principle of the plant is most concentrated. In India, the seeds are prepared for use by submitting them to slight torrefaction, by which the shell is rendered more easily separable, and the acrid property is mitigated. In the dose of one or two grains, the kernel purges with great activity. The oil is obtained by expression from the seeds, in general previously roasted, and deprived of the shell. It contains an acrid purgative principle which has been named *tiglin*. The oil is a powerful hydragogue purgative, acting, for the most part, when administered in moderate doses, (one to two drops,) with ease to the patient; but in larger doses it is apt to excite vomiting and severe griping pain, and if immoderately taken, may produce fatal effects. Applied externally, it produces inflammation of the skin, attended with a pustular eruption."—*U. S. Dispensatory.*

* Dr. Christison has made the few remarks contained in this section concerning pepper, under the head of mechanical irritants. Its proper place appears to us among the vegetable acrids, several of the species *Piper* possessing such properties in a high degree. Thus the *P. betel* and *P. Siriboa* produce the betel, used for chewing by the Malays, but which is an acrid stimulating substance. The *P. inebrians* possesses narcotic properties, of which the South Sea Islanders avail themselves for preparing an intoxicating beverage. Cubebs, the fruit of *P. cubeba,* says Dr. A. T. Thomson, in some habits, ex-

GROUP SECOND.

OF POISONING WITH THE ANIMAL ACRIDS.

419. The second group of the fifth order of poisons comprehends most of those derived from the animal kingdom. In action they resemble considerably the vegetable acrids, their most characteristic effect being local inflammation; but several of them also induce symptoms of an injury of the nervous system.

420. This group includes cantharides, poisonous fishes, venomous serpents, and decayed or diseased animal matter.

SECT. I.—*Of Poisoning with Cantharides.*

1. *Of the Action of Cantharides and the Pathological Symptoms it excites in Man.*

421. Cantharides,* either in the form of powder, tincture, or oily solution, is an active poison both to man and animals. The active properties of the fly reside partly in a crystalline principle, and partly in a volatile oil, which is the source of its nauseous odor.

---

cite great irritation and fever. In a case on record, this irritation was so considerable from the administration of one drachm of the powder of cubebs, that it tended to hasten the death of the patient.—Another case is mentioned, in which temporary paralysis followed the use of cubebs in doses of two drachms three times a day.

* Many insects of the order coleopteræ, besides the *cantharis vesicatoria*, or Spanish fly, possess vesicating properties,

422. Experiments made on animals with cantharides do not furnish any satisfactory proof of the absorption of the poison, but rather tend to show that it does not enter the blood. Such a conclusion, however, must not be too hastily drawn; since its well known effects on man when used in the form of a blister, lead to the conclusion that it is absorbed, and that it produces its peculiar effects on the urinary system through the medium of the circulation.

423. The symptoms produced by cantharides in man are more remarkable than those observed in animals. The following relation of a case gives a rational and unexaggerated account of the symptoms as they commonly appear. A young man in consequence of a trick of his companions, took a drachm of the powder. Soon afterwards he was seized with a sense of burning in the throat and stomach; and in about an hour with violent pain in the lower belly. When his physician first saw

and have doubtless the same action on the animal system.—This vesicating property has been observed to bear some relation to the organization of the insect possessing it: hence, entomologists have arranged them in a separate tribe, belonging to the family of the trachelidæ, order coleopteræ, and composed of the extensive genus meloë of Linnæus sub-divided into other genera, the chief of which are: the *cantharis,* the *meloë,* properly so called, and the *mylabris.* Of the genus cantharis there are several species, natives of different parts of the United States, that are employed as substitutes for the Spanish fly. The principal species are: *Cantharis vittata,* or potato fly, *C. cinerea, C. marginata* and *C. atrata.*

him, his voice was feeble, breathing laborious, and pulse contracted; and he had excessive thirst, but could not swallow any liquid without unutterable anguish. He was likewise affected with priapism. The pain then became more extensive and severe, tenesmus and strangury were added to the symptoms, and after violent efforts he succeeded in passing by the anus and urethra only a few drops of blood. By the use of oily injections into the anus and bladder, together with a variety of other remedies intended to allay the general irritation of the mucous membranes, he was considerably relieved before the second day; but even then he continued to complain of great heat along the whole course of the alimentary canal, occasional priapism, and difficult micturition. For some months he labored under difficulty of swallowing. Another case very similar in its circumstances has been related, where, in addition to the above symptoms, there was much salivation, and towards the close of the second day a large cylindrical mass of the inner membrane of the gullet was discharged by vomiting.

424. Among the symptoms, the affection of the throat, causing difficult deglutition and even an aversion to liquids, appears to be pretty constant. The sense of irritation along the gullet and in the stomach is also generally considerable. Sometimes it is attended with bloody vomiting; and at other times, as in the instance of poisoning with the acids, there is vomiting of membranous flakes.

425. A very prominent symptom in most cases is distressing strangury, generally connected with suppression of urine and the discharge of blood from the urethra. It would appear, that when the genital organs are much affected, the inflammation may run to gangrene of the external parts.

426. The preceding symptoms are occasionally united with signs of an injury of the nervous system. Headache is common, and delirium is sometimes associated with it. In a case on record, the leading symptoms at first were strangury and bloody urine; but these were soon followed by violent convulsions and occasional loss of recollection. *The quantity in that instance was only eight grains.* In another case, the patient was attacked during convalescence with violent frenzy of three days continuance. An instance is also related of tetanic convulsions and hydrophobia appearing three days after a small overdose of the tincture of cantharides was taken, and continuing for several days with extreme violence.

427. The *quantity* of the powder or tincture which is required to prove fatal or dangerous, has not been accurately settled. It is probable that this is one of the poisons whose operation is liable to be materially affected by idiosyncracy. The medicinal dose is from half a grain to two grains of the powder, and from ten drops to two drachms of the tincture. But an instance is mentioned, where six ounces of the tincture was taken without injury. On the other hand, the case of a lad is affirm-

ed to, who used to be attacked with erection and and involuntary emission on merely smelling the powder.

2. *Of the Treatment of Poisoning with Cantharides.*

428. The treatment of poisoning with cantharides is not well established. No antidote has yet been discovered. At one time fixed oil was believed to be an excellent remedy. But experiments rather prove that oil is the reverse of an antidote, (421.) A case is mentioned which was evidently exasperated by the use of oil.

429. When the accident is discovered early enough, and vomiting has not already begun, emetics may be given; and if vomiting has begun, it is to be encouraged. Oleaginous and demulcent injections into the bladder, generally relieve the strangury. The warm-bath is a useful auxiliary. Leeches and blood-letting are required, according as the degree and stages of the inflammation may seem to indicate.

3. *Of the Morbid Appearances caused by Cantharides.*

430. The morbid appearances caused by cantharides may be gathered from the following account of a case, the history of which has been recorded. The brain was gorged with blood. The omentum, peritonæum, gullet, stomach, intestines, kidneys, ureters, and internal parts of generation were in-

flamed; and the mouth and tongue were stripped of their lining membrane. In dogs there was observed, besides the usual signs of imflammation in the alimentary canal, great redness of the tubular part of the kidneys, redness and extravasated patches on the inside of the bladder, and redness of the ureters as well as of the urethra.

431. When the case has been rapid, the remains of the powder will probably be found in the stomach, and it may easily be discovered by its resplendent green color. It appears that the powder does not undergo decomposition for a long time when mixed with decaying animal matters. After nine months' interment, the resplendent green points continue brilliant; and the powder may be separated by immersing the parts in boiling water. The fatty matter rises to the surface, while the cantharides powder falls to the bottom, and will be found to retain all its characteristic properties.

SECT. II.—*Of the Deleterious Effects of Poisonous Fish.*

432. The species of fish which act deleteriously, either always, or in particular circumstances, have also been commonly arranged in the present order of poisons.

433. The subject of fish-poison, is one of the most singular in the whole range of toxicology, and none is at present veiled in so great obscurity. It is well ascertained that some species of fish, particularly in hot climates, are always poisonous—

that some though generally salubrious and nutritive,—such as the oyster and still more the muscle,—will at times acquire properties which render them hurtful to all who eat them,—and that others,—such as the shell-fish now mentioned, and even the richest sorts of vertebrated fishes,—though actually eaten with perfect safety by mankind in general, are nevertheless, poisonous, either at all times or only occasionally, to particular individuals. But hitherto the chemist and the physiologist have in vain attempted to discover the cause of their deleterious operation.

444. Of fishes which are commonly nutritive, but sometimes acquire poisonous properties, by far the most remarkable is the common *muscle.* Opportunities have often occurred for observing its effects—so often, indeed, that its occasional poisonous qualities, have become an important topic of medical police, and in some parts, as in the neighborhood of Edinburg and Leith, it has of late been abandoned by many people as an article of food, although generally relished, and in most circumstances undoubtedly safe.

445. *Oysters* sometimes acquire deleterious properties analagous to those acquired by muscles. But fewer facts have been collected regarding them. It has been asserted that even wholesome oysters have a tendency to act deleteriously on women immediately after delivery. They are said to have induced apoplexy or convulsions; that the symptoms generally come on the day after the oys-

ters were taken; and two cases are reported to have proved fatal.

446. *Eels* have also been at times found in temperate climates to acquire poisonous properties.

SECT. III.—*Of Poisoning by Venomous Snakes and the Sting of Insects.*

447. Another entire group of poisons allied to the acrid vegetables in their action, but infinitely more energetic, comprehends the poisons of the venomous serpents. There are some, however, especially among those of hot climates, which appear also to act remotely on the centre of the nervous system, and to occasion death through means of that action.

448. The poisonous species of serpents are provided with a peculiar apparatus, by which the poison is secreted, preserved, and introduced into the body of the animal it attacks. The apparatus consists of a gland behind each eye, of a membranous sac at the lateral and anterior part of the upper jaw, and of a hollow curved tooth surrounded and supported by the sac. The cavity of the tooth communicates with that of the sac, and terminates near the tip in a small aperture, by which the poison is expelled into the wound made by the tooth.

449. The symptoms caused by the bite of the *viper*, are lancinating pain, which begins between three and forty minutes after the bite, and rapidly stretches up the limb,—swelling, at first firm and

pale, afterwards red, livid and hard,—tendency to fainting, bilious vomiting, sometimes convulsions, more rarely jaundice,—quick, small, irregular pulse,—difficult breathing, cold perspiration, dimness of vision, and injury of the mental faculties. Death may ensue.

450. The activity of the poison of the viper depends on a variety of circumstances. When kept long confined the animal loses its energy; and after it has bitten several times in rapid succession, its bite ceases for some time to be poisonous, as the supply of poison is exhausted. It appears also to be most active in hot and dry climates. Those cases are always the most severe in which the symptoms begin soonest; and the danger increases with the number of the bites.

451. An important observation which has been made is, that danger need not be dreaded except when the bite is inflicted on small organs such as the fingers or toes, because larger parts cannot be fully included between the animal's jaws, and fairly pierced by its fangs, but can only be scratched.

452. The properties of the fluid contained in the reservoir do not cease with the animal's life; nay, they continue even when the fluid is dried and preserved for a length of time.

453. The fluid may be swallowed in considerable quantity without causing any injury whatever.

454. The European *insects* known to have a poisonous sting are chiefly the scorpion, tarantula, bee and wasp. The poison of these insects

occasions diffuse cellular inflammation, which always ends in resolution. It is said, however, that death has been sometimes caused in consequence of a whole hive attacking an intruder and covering his body with their stings.

455. *Treatment of poisoning by the bite of the viper.* The application of cupping-glasses has been lately resorted to with success for curing the bite of the viper. The case of a patient is related, who two hours after being bitten had all the constitutional symptoms strongly developed, such as slow, very feeble pulse, nausea, vomiting and swelling of the face. When a cupping-glass was applied for half an hour, the general symptoms ceased and did not return. Next day diffuse inflammation began; but it was checked by leeches.*

---

* As cupping-glasses are seldom at hand, it will be found advisable to have immediate recourse to what appears to be decidedly the most efficient mode of extracting the poison, namely, to apply the mouth and suck the wound. This can be frequently done by the patient himself; if otherwise, no assistant should hesitate a moment to perform that office, which is not attended by any danger. The next step is to open the wound freely, with a knife or lancet, and instantly suck it again repeatedly, pinching up the skin and flesh around it, deeply, with the thumb and fingers of both hands. A ligature must also be applied above the wound, which should finally be filled with common salt, and bandaged. This method is actually practised by some tribes of Indians in South America with the most decisive success; unless any of the larger vessels be punctured. In this case the venom may so speedily mix with the vital fluid as to preclude all remedies. But in ordinary cases, the operation just described,

SECT. IV.—*Of Poisoning by Diseased and Decayed Animal Matter.*

456. Another and much more important group of poisons that may be arranged in the present order, comprehends animal matter usually harmless, or even wholesome, but rendered deleterious by disease or decay. The poisons are formed in three ways; by morbid action local or constitutional, by ordinary putrefaction, and by modified putrefaction.

I. *Of Animal Matter rendered Poisonous by Diseased Action.*

457. Under the first variety might be included the latent poisons by means of which natural dis-

if promptly executed, will be sufficient. If, however, some time has elapsed, means must be employed to counteract the effects of absorption. For this purpose it is best to cause the patient to swallow a large dose of opium, together with wine or other alcoholic stimuli, and the infusion of some aromatic plants (*Aristolochia serpentaria.*) The warm bath is a potent auxiliary; and if sweat is not soon produced, the patient should be bled whilst in the bath. If a warm perspiration comes on, the patient may, in general, be considered as out of danger.

This mode of treatment is taken from an interesting paper on snake-poisons, by Dr. Hancock, published in the Journal of the R. I. It is said to be partly deduced from personal experience, and partly from the usage of the natives, and it is thought would seldom fail of success if properly pursued, even in the worst cases, from the bites of the *rattle-snake*, and other venomous serpents. The doctor adds, moreover, there can be no doubt that *hydrophobia* might, by the same means, be prevented with equal safety and success.

eases are communicated by infection, contact, and inoculation. Such poisons, however, being usually excluded from a strict toxicological system, the only varieties which remain to be noticed are the animal poisons engendered by disease, and which do not produce peculiar diseases, but merely inflammation. Several species of this kind may be mentioned, comprehending the solids and fluids in various unhealthy states of the body.

458. One of these poisons, contained in the blood, and perhaps in some secretions of *overdriven cattle*, arises under circumstances in which the body seems to deviate very little from its natural condition. It has been found, as regards this subject, that the flesh of such animals is wholesome enough when cooked and eaten: but that if the blood or raw flesh be applied to a wound or scratch; nay, even sometimes to the unbroken skin, a dangerous and often fatal inflammation is excited, which at times differs little from diffuse cellular inflammation, and at other times consists of a general eruption of gangrenous boils, the *pustules malignes* of the French. The deleterious effects occasionally observed to arise from offal, are probably analagous in their nature and their cause.

459. Another species of poison allied to the preceding in its effects, and equally obscure in its nature, includes certain fluids of the human body after natural death, which are probably modified, if not even formed altogether, by morbid processes during life. Such poisons are the most frequent

source of the dreadful cellular inflammation, which has lately been often witnessed as the consequence of pricks received during dissection by the anatomist. It is still a matter of question among pathologists what these poisons are, and in what circumstances they spring up. But whatever may be the nature and origin of this poison, we are well enough acquainted with its effects; which are diffuse inflammation and violent constitutional excitement, rapidly passing into a state resembling typhoid fever. Sometimes the inflammation spreads steadily towards the trunk from the part to which the poison was applied; sometimes the inflammation around the injury is trifling and limited, but a similar inflammation appears in or near the axilla, and subsequently on other parts of the body; and the latter form of disease is always attended with the highest constitutional injury, and with the greatest danger.

460. Another singular poison, unequivocally the product of disease, and which acts as a local irritant, is the flesh or fluids of animals affected at the time of their death with a carbuncular disorder, denominated in Germany *milzbrand*, and analagous to the *pustule maligne* of the French. It is a constitutional and epidemic malady, which sometimes prevails among cattle on the continent of Europe to an alarming extent, and is characterised by the eruption of large gangrenous carbuncles on various parts of the body. This distemper has the property of rendering the solids and fluids poisonous, to

so great a degree, that not only persons who handle the skin, entrails, blood, or other parts, but even also those who eat the flesh, are apt to suffer severely. The affection thus produced in man, is sometimes ordinary inflammation of the alimentary canal, or cholera; more commonly a disorder precisely the same as the pustule maligne; but most frequently of all an eruption of one or more large carbuncles resembling those of the original disease of the cattle. It is often fatal. The carbuncular form has been known to cause death in forty-eight hours.—It is a curious fact, that the carbuncle of cattle may be caused by applying to a wound the blood or spleen of an animal killed by gangrene of the lungs.*

461. A poison analagous to the former in its nature, which has sometimes occasioned severe and even fatal effects in man, is the matter of *glanders*, a contagious disease to which the horse is peculiarly subject, and which is communicated probably by means of a morbid secretion from the nostrils. This disease has been communicated to man by infection; at least instances have been related where

---

* The disorders mentioned in the text occur chiefly on the continent of Europe, and are little known either in Great Britain or in this country. To this head, however, may be referred a remarkable disease incident to cattle, and to man under the name of *milk-sick,* which has occasionally prevailed in some of the newly settled portions of our western states, and of which detailed accounts have been furnished by Drs. Lea, Dixon, and McCall, of Tennessee. See Philadelphia Journal of Medical and Physical Sciences, edited by N. Chapman, vol. ii. p. 50, and vol. iv. p. 318.

grooms attending glandered horses, although they had no external injury through which the inoculation could take place, were attacked with profuse fetid discharge from the nostrils, a pustular eruption on the face, and colliquative diarrhœa, which has sometimes ended fatally in a few days. In other instances, inoculation of the hand with the blood of the glandered horse has produced alarming diffuse inflammation, and a carbuncular eruption.

2. *Of Animal matter rendered poisonous by Common Putrefaction.*

462. The second mode in which animal matters, naturally wholesome or harmless, may acquire the properties of irritant poisons, is by their undergoing ordinary putrefaction.

463. Putrid animal matter when injected into the veins of healthy animals, proves quickly fatal; and the disease induced seems to resemble closely the typhoid fever of man. Similar effects were observed, when dogs were confined over vessels in which animal matter was decaying, so that they were obliged always to breathe the exhalation.

464. The effects of putrid animal matter when applied to wounds, have been investigated experimentally, and it was found that putrid blood, bile, or brain, caused death in this way within twenty-four hours,—producing extensive local inflammation of a diffuse kind, and great constitutional fever. In man also, several instances of diffuse cel-

lular inflammation have been observed as the consequence of pricks received during the dissection of putrid bodies.

465. The putrid matter formed by keeping flesh long in close vessels, has been examined chemically, and was found to consist of carbonate of ammonia, much caseate of ammonia, and a stinking volatile oil,—the last of which is probably the poisonous ingredient.

3. *Of Animal Matter rendered poisonous by Modified Putrefaction.*

466. The third way in which animal matters, naturally wholesome, may become irritant poisons, is by their undergoing a modified putrefaction.—In this way three common articles of food are apt to acquire very dangerous properties, namely, a particular kind of *sausage*, a particular kind of *cheese* and *bacon*.

467. The *sausage*, which is apt to occasion baneful effects, is of two sorts, the white and the bloody sausage, (*leberwurste, blutwurste.**) Both are of large size, the material being put into swine's stomachs; and they are cured by drying and smoking them in a chimney with wood smoke. Those which have been found to act as poisons, possess an acid reaction, are soft in consistence, have a nauseous putrid taste, and an unpleasant

---

* These sausages, made by the inhabitants of German origin, are frequently brought to the Baltimore market, but we are not aware that they have ever occasioned any accidents.

sweetish-sour smell, like that of purulent matter. They are met with principally about the beginning of spring, when they are liable to be often alternately frozen and thawed in the curing. Those sausages only become poisonous which have been boiled before being salted and hung up. They are poisonous only at a particular stage of decay, and cease to be so when putrefaction has advanced so far that sulphuretted-hydrogen is evolved. The central part is often poisonous, when the surface is wholesome.

468. The symptoms of the *sausage poison* seldom begin till about twenty-four, or even forty-eight hours after the noxious meal, and rather later than earlier. The tardiness of their approach seems owing to the great indigestibility, of the fatty matter with which the active principle is mixed. The first symptoms are pain in the stomach, vomiting, purging, and dryness of the mouth and nose. The eyes, eyelids, and pupils then become fixed and motionless; the voice is rendered hoarse, or is lost altogether; the power of swallowing is much impaired; the pulse gradually fails, frequent swoonings ensue, and the skin becomes cold and insensible. The secretions and excretions, with the exception of the urine, are then commonly suspended; but sometimes profuse diarrhœa continues throughout. The appetite is not impaired; fever is rarely present; and the mind continues to the last unclouded. Fatal cases end with convulsions and oppressed breathing between the third and

eighth day. In cases of recovery, the period of convalescence may be protracted to several years.

469. The chief appearances in the dead body are the signs of inflammation in the mucous membrane of the alimentary canal,—whiteness and dryness of the throat, thickening of the gullet, redness of the stomach and intestines; also croupy deposition in the wind-pipe; great flaccidity of the heart; and a tendency in the whole body to resist putrefaction.

470. The *sausage poison* is supposed to reside in a peculiar fatty acid, to which the name of *botulinic acid* (*wurst-felt-saure*) has been applied.—It concentrates in itself the poisonous properties of the crude sausage. Thirty grains of it, which formed three-fourths of the whole product of a single sausage, were given in two doses to a puppy with an interval of a day between them. For some hours after the second dose, no apparent effect was produced. But gradually the animal became dull, lay in the same spot, wasted rapidly away, notwithstanding a vigorous appetite, and died of exhaustion on the thirteenth day. Half a grain causes insupportable dryness in the throat, which does not go off for several hours.

471. The *poison of cheese* has been longer and more generally known; and, for a long time, the prevalent belief was, that the cheese acquired an impregnation from copper vessels used in the dairies. This opinion, however, was proved by chemical analysis, to be untenable, and subsequent

inquiries have now rendered it probable that the poisonous property of the cheese resides in two animal acids, analagous, if not identical with the caseic and sebacic acids, and, consequently, that the poisonous cheese belongs to the same genus as the noxious sausages.

472. The poisonous cheeses have been described as of a yellowish-red, soft, and tough, with harder and darker lumps interspersed; they have a disagreeable taste, redden litmus, and become flesh-red instead of yellow, under the action of nitric acid. They have, on the other hand, been said to present no peculiarity in their appearance, taste, or smell.

473. The symptoms they cause in man appear to be nearly the same with those produced by the poisonous sausage, and usually commence, according to *Hunefeld*, in five or six hours, according to *Westrumb*, in half an hour. They constitute various degrees and combinations of gastro-enteric inflammation. In the most severe cases on record the quantity taken did not exceed four ounces, and was sometimes only an ounce.

474. Another common article of food, which has occasionally produced similar effects with the poisonous saugages and cheese, is *bacon*. This property is probably owing likewise to the presence of a fatty acid, analagous to that of the sausage and cheese, and which may be formed during the process of curing the meat.

475. The symptoms of poisoning in this way,

are almost exactly the same with those produced by the sausage poison, with the addition, however, of delirium and loss of recollection.

476. It may be added, that severe cholera has been several times known to be induced by the oily matter about the fins of *kipper*, or cured salmon. This matter is undoubtedly acrid.

CHAPTER X.

CLASS SECOND.

SECT. I. *Of the Narcotic Poisons generally.*

477. THE term narcotism is now generally understood to denote the effects of such poisons as bring on a state of the system like that caused by apoplexy, epilepsy, and other disorders commonly called nervous.* Narcotic poisons, therefore, are such as produce chiefly or solely symptoms of a disorder of the nervous system.

478. The mode in which most of the narcotic poisons act, has been well ascertained: They act on the brain or spinal marrow or both, by entering the blood vessels. Hence they are most active when most directly introduced into the blood, that is, when injected into the veins; and when they are applied to an entire membranous surface, their energy is in the ratio of its absorbing power.—Thus, when injected into the chest, they act more rapidly than when swallowed.

---

* For some excellent and pertinent remarks on the diagnosis between *apoplexy, epilepsy, inflammation of the brain, hypertrophy of the brain, inflammation of the spinal chord, syncopal asphyxia, &c.* and narcotism, see Dr. Christison's Treatise on Poisons, page 578 et seq. ed. 2d.

479. According to the generally received opinion, they are conveyed with the blood to the brain and spinal marrow on which they act. But, according to the experiments of *M. M. Morgan* and *Addison*, they produce, on the inner coats of the blood vessels, a peculiar impression, which is conveyed to the centre of the nervous system along the nerves.

480. The *symptoms* of poisoning with the narcotics, in man and the higher order of animals, are giddiness, headache, obscurity or depravation of the sight, stupor or perfect insensibility, palsy of the voluntary muscles or convulsions of various kinds, and towards the close, complete coma.

481. The symptoms of each poison are pretty uniform, when the dose is the same. But each has its own peculiarities, either in the individual symptoms, or in the mode in which they are combined together.

482. The *morbid appearances* they leave in the dead body are commonly insignificant. In the brain, where chiefly the physician is led from the symptoms to expect unnatural appearances, the organs are in general quite healthy. Sometimes, however, the veins are much gorged with blood, and the ventricles and membranes contain serosity. The blood appears to be sometimes altered in its nature; but these changes are by no means invariable, and are sometimes not remark ed at all.

483. The genera comprehended in the class of narcotics, are opium, henbane, lettuce-opium, solanum, hydro-cyanic acid, and the deleterious gases.

484. Most of the narcotic vegetables owe their poisonous properties to a peculiar principle, slightly different in each, and in which are concentrated all the leading properties of the drug from which they are procured.*

SECT. II.—*Of the Poisoning with Opium.*†

1. *Of the Action of Opium, and the Pathological Symptoms it excites in Man.*

485. The mode of action, of opium, has long been a subject of dispute, both among physicians and toxicologists; and in some particulars our knowledge is still vague and insufficient.

486. From some experiments it might be inferred that opium has the power of stupefying or suspending the irritability of the parts to which it is immediately applied.

487. This poison has also powerful constitutional or remote effects, which are chiefly produced on the brain. Much discussion has arisen on the question, whether these constitutional effects are owing to the conveyance of the local torpor along the nerves to the brain, or to the poison being absorbed, and so acting on the brain through the blood. The question is not yet settled. It appears pretty

---

* Others contain hydro-cyanic acid as their active principle. —See SECT. VI.

† The chief pharmaceutical preparations which contain opium, are: Tinctura opii, (*laudanum*,) Vinum opii, Acetum opii, *Black drop*, *Battley's sedative solution*, and Syrupus opii.

certain, however, that the poison cannot act constitutionally without entering the blood-vessels; although it is not so clear, that after it has entered them, it acts by being carried with the blood to the brain. The newest doctrine supposes that it enters the blood-vessels, and produces in their inner coat an impression which is conveyed along the nerves.

488. The effects of opium, through whatever channel it may produce them, are exerted chiefly on the brain and nervous system. In animals, the symptoms are different from those remarked in man.

489. According to the most recent inquiries, which were extended to every class of the lower animals, opium produces three leading effects. It acts on the brain, causing congestion and consequently sopor; on the general nervous centre as an irritant, exciting convulsions; and on the muscles as a direct sedative. It is poisonous to all animals—man, carnivorous quadrupeds, the *rodentia*, birds, reptiles, amphibious animals, fishes, insects, and the *mollusca*. But of its three leading effects some are not produced in certain classes or orders of animals. In the *mammalia*, with the exception of man, there is no cerebal congestion induced,* and death takes place amidst convulsions. In birds there is some cerebral congestion towards the close; but still the two other phenomena are the most prominent.

---

* A doubt may be expressed whether such exceptions really exist.

490. On man the effect of a small dose of opium, seems to be generally in the first instance stimulating. The action of the heart and arteries is increased, and a slight sense of fulness is caused in the head. This stimulus differs much in different individuals. In most persons it is quite insignificant.

491. The effect of a full medicinal dose of three grains of solid opium, or a drachm of the tincture, is to produce in general a transient excitement and fulness of the pulse, but in a short time afterwards torpor and sleep, commonly succeeded in six, eight, or ten hours by headache, nausea, and dry tongue.

492. The symptoms of poisoning with opium when it is administered at once in a dangerous dose, begin with giddiness and stupor, generally without any previous stimulus. The stupor rapidly increasing, the person soon becomes motionless and insensible to external impressions; he breathes very slowly, generally lies quite still, with the eyes shut and the pupils contracted; and the whole expression of the countenance is that of deep and perfect repose. As the poisoning advances, the features become ghastly, the pulse feeble and imperceptible, the muscles excessively relaxed, and, unless assistance is speedily procured, death ensues. If the person recovers, the sopor is succeeded by prolonged sleep, which commonly ends in twenty-four or thirty-six hours, and is followed by nausea, vomiting, giddiness, and loathing of food.

493. The period which elapses between the taking of the poison and the commencement of the symptoms, is various. A large quantity, taken in the form of tincture, and on an empty stomach, may begin to act in a few minutes; but for obvious reasons it is not easy to learn the precise facts as to this particular. For the most part, however, if opium is taken in the solid form, it does not begin to act for half an hour, or even almost a whole hour,—that period being required to allow its poisonous principles to be separated and absorbed by the bibulous vessels. In some rare cases the sopor is put off for a longer period—considerably more than an hour; and there is reason for thinking that the interval may be much longer, if at the time of taking the opium the person was excited by intoxication from previously drinking spirits.

494. The most remarkable symptom in the generality of cases of poisoning with opium, is the peculiar sopor. This state differs from coma in the patient continuing long capable of being roused. It may be difficult to rouse him; but unless death is very near, this may be almost always accomplished by brisk agitation, tickling of the nostrils, loud speaking, or the injection of water into the ear. The state of restored consciousness is always imperfect, and is speedily followed again by lethargy when the exciting cause is withheld.

496. Convulsions, although very regularly produced in animals by opium, are rarely caused in man: yet when they do occur, they are sometimes

very violent. The convulsions sometimes assume the form of permanent spasm, which may affect the whole muscles of the body.

497. Another rare symptom of poisoning with opium, is delirium. It appears to occur occasionally along with convulsions.

498. The state of the pulse varies considerably. When the dose has been so large as seriously to endanger life, its most common condition seems to be feeble and irregular, at ninety. Very frequently, however, it is much slower; and then it is rather full than feeble, just as in apoplexy. In the cases where convulsions occur, it is for the most part hurried, and does not become slow till the coma becomes pure. It always becomes towards the close very feeble, and at length imperceptible.

499. The respiration is almost always slow. Sometimes it is stertorous; but this is not common. On the contrary, it is more frequently very gentle; and sometimes it can hardly be perceived even in persons who eventually recover.

500. The pupils are always at least sluggish in their contractions, often quite insensible;—sometimes they are dilated; but much more commonly contracted, and occasionally to an extreme degree.

501. The expression of the countenance is for the most part remarkably placid, like that of a person in a sound natural sleep. Occasionally there is an expression of anxiety mixed with the stupor. The face is commonly pale. Sometimes, however, it is flushed; and in rare cases the expression is furious.

502. In moderately large doses, opium generally suspends the excretion of the urine and fæces; but it promotes respiration. In dangerous cases the lethargy is sometimes accompanied with copious sweating.

503. For the most part the person who recovers from the stupor caused by opium, is soon restored to health, weakness of the stomach continuing for a few days. In a case on record, however, there were convulsions and somnolency on the third day; palsy of one arm continued for four days; and for nearly two months afterwards the patient complained of occasional attacks of weakness and numbness, sometimes of one extremity, sometimes of another. Here the brain must have sustained more permanent injury than usual.

504. Notwithstanding the purely narcotic or nervous symptoms, which opium produces in a vast proportion of instances, there is no doubt that it produces in a few rare cases those of irritation also. Thus, although it generally constipates the bowels, it has been known to induce diarrhœa or colic in particular constitutions.

505. Another and more singular anomaly is the spontaneous occurrence of vomiting. Sometimes a little vomiting immediately succeeds the taking of the poison. This may not interrupt, however, the progress of the symptoms; but more commonly it is the means of saving the person's life. At other times vomiting occurs at a much later period. Vomiting is a common enough symptom after the

administration of emetics, or subsequent to the departure of the somnolency.

506. *The ordinary duration* of a fatal case of poisoning with opium is from seven to twelve hours. Most people recover who outlive twelve hours. At the same time fatal cases of longer duration are on record. Sometimes, too, death takes place in a shorter time than seven hours; six hours is not an uncommon duration. A case is related which proved fatal in three hours.

507. The *dose* of opium requisite to cause death has not been determined. Indeed it must vary so much with circumstances, that it is almost vain to attempt to fix it. It is known that the dose required to prove fatal is very much altered by habit. Those who have been accustomed to eat opium are obliged gradually to increase the dose, otherwise its usual effects are not produced.

508. The only other modes in which poisoning with opium has been produced in man, besides administration by the mouth, has been by injection into the anus, by application to the skin deprived of its cuticle, and perhaps even also to the unbroken skin.

2. *Of the Treatment of Poisoning with Opium.*

509. *The primary object is to remove the poison from the stomach.* This is proper even in the rare cases in which vomiting takes place spontaneously. It is by no means easy to remove all the opium by vomiting, especially if it is taken in the solid

state; for it becomes so intimately attached to the lining mucus of the villous coat, that it is never thoroughly removed till the mucus is also removed, which is always with difficulty effected.

510. The removal of the poison is to be accomplished in one of three ways, by emetics administered in the usual manner* by the stomach-pump, or by the injection of emetics into the veins.

511. By far the best emetic is the *sulphate of zinc* in the dose of half a drachm or two scruples, which may be repeated after a short interval, if the first dose fails to act. In order to insure its action it is of great use to keep the patient roused as much as possible,—a point which is often forgotten. The sulphate of copper has been used by some as an emetic; but it is by no means so certain as the sulphate of zinc. Besides, as it is a much more virulent poison, it may prove injurious, if retained long in the stomach. Tartar emetic, from the uncertainty of its action when given in considerable doses, is even worse adapted for such cases.

512. Emetics should be preferred for removing the poison from the stomach, provided the case be not urgent. Even then, however, they sometimes fail altogether. The best practice in that case is to endeavor to remove the poison with the *stomach-pump; and this in urgent cases should be the first remedy employed.* In using the stomach-pump

---

* Or injected into the rectum. (514.)

care must be taken not to injure the stomach by too forcible suction.

513. When the stomach-pump is not at hand it has been recommended to substitute a long tube with a bladder attached. After the stomach has been filled with warm water from the bladder, the tube is to be turned down so as to act upon the contents of the stomach as a syphon.

514. Another method of removing opium from the stomach, which has been practised successfully when the patient could not be made to submit to the common treatment, *is the injection of tartar emetic into the rectum.* A case is related where this treatment proved successful. Fifteen grains, in half a gallon of water, excited free vomiting, and ten grains more renewed it. Care was taken to insure the discharge of the whole tartar emetic by a subsequent purgative injection.

515. The last method for removing opium from the stomach, namely, the injection of an emetic into the veins, is a desperate one, which can only be recommended when emetics by the mouth have utterly failed, and when the stomach-pump, or the substitute, (513,) cannot be procured. Tartar emetic is the best for this purpose, and its effect is almost certain. A grain is the dose. While injecting it care must be taken by the operator not to introduce air into the vein.*

---

* The mode of treatment suggested in this paragraph has been strongly objected to. Dr. Christison, however, seems to recommend it with some confidence *in desperate cases.*

516. The next object in conducting the treatment of poisoning with opium, is to keep the patient constantly roused. This alone is sufficient when the dose is not large, and the poison has been discharged by vomiting; and in every case it forms, next to the evacuation of the stomach, the most important part of the treatment. Pulling the hair and injecting water into the ears are powerful modes of rousing the patient.

517. The best method, of keeping the patient roused, is to drag him up and down between two men, who must be cautioned against yielding to his importunate entreaties, and occasional struggles to get free and rest himself. For the sopor returns so rapidly, that a patient has been known to answer two or three short questions quite correctly on being allowed to stand still, and suddenly drop the head in a state of insensibility while standing. The duration of the exercise should vary according to circumstances from three, or six, to twelve hours. When he is allowed at length to take out his sleep, the attendants must ascertain that it is safe to do so by rousing him from time to time; and if this should become difficult he must be turned out of bed again and exercised as before.

518. It appears, from some published cases, that the most insensible may be roused to a state of almost complete consciousness for a short time, by dashing cold water over the head and breast. This treatment can never supersede the use of

emetics; and, as its effect is but temporary, it ought not to supersede the plan of forced exercise. But it appears to be an excellent way to insure the operation of emetics.

519. If the emetic is about to fail in its effects, cold water dashed over the head restores the patient for a few moments to sensibility, during the continuance of which the emetic operates. Dashing cold water over the head may, perhaps, be dangerous in the advanced stage, when the body is cold and the breathing imperceptible; but the most desperate remedies may be then tried, as the patient is generally in almost a hopeless state.

520. In some cases internal stimulants have been given with advantage, such as assafœtida, ammonia, camphor, musk, &c. It is always useful to stimulate the nostrils from time to time, by tickling them, or holding ammonia under the nose; but the application should be neither frequent nor long continued, as the ammonia may cause deleterious effects when too freely inhaled.

521. Venesection has been recommended and successfully used by some physicians. If the stomach be emptied, and the patient kept roused, as may almost always be done when means are resorted to in time, venesection will be unnecessary. Sometimes, however, when the pulse is full and strong, it may be prudent to withdraw blood; and it certainly appears that in most cases where this remedy has been employed the sensibility began to return almost immediately after. In some cases, on the contrary, it has seemed injurious,

probably because it was not had recourse to till the patient was moribund. It ought not to be resorted to till the poison is thoroughly removed from the stomach; for it favors absorption.

522. In desperate circumstances artificial respiration may be used with propriety. After the breathing has been almost or entirely suspended the heart continues to beat for some time; and so long as its contractions continue, there is some hope that life may be preserved. But it is essential, for the continuance of the heart's action, that the breathing be speedily restored to a state of much greater perfection, than that which attends the close of poisoning with opium. It is not improbable that the only ultimate cause of death from opium is suspension of the respiration, and that if it could be maintained artificially, so as to resemble exactly the natural breathing, the poison in the blood would be at length decomposed and consciousness gradually restored.

523. Of the many *antidotes* which have from time to time been proposed for poisoning with opium, many of them have been examined with great care, such as vinegar, tartaric acid, lemonade, infusion of coffee, decoction of galls, solution of chlorine, camphor, diluents; and they have all been found *useless* before the poison is expelled from the stomach.*

---

* *Magnesia* has been recommended for neutralising the effects of opium in the stomach. It is supposed to act by decomposing the meconate of morphia, thus throwing down the morphia in an uncombined and nearly insoluble state.

524. When the opium has been completely removed, the vegetable acids and infusion of coffee have been found useful in reviving the patient, and subsequently in subduing sickness, vomiting, and headache; but till the poison is removed the administration of acids is worse than useless, provided the opium was given in the solid state, because its solution in the juices of the stomach is accelerated.

3. *Of the Morbid Appearances caused by Opium.*

525. Of the appearances left by poisoning with opium it may be first remarked, that turgescence of the vessels in the *brain*, and watery effusion into the ventricles, and on the surface of the brain, are generally met with. But congestion and effusion are by no means universal. Extravasation of blood is a very rare effect of opium. There is little doubt, however, that poisoning with opium may cause extravasation, by developing a disposition to apoplexy; but considering the very great variety of this appearance in persons killed by opium, it may reasonably be questioned whether extravasation can be produced without some such predisposition co-operating.

526. The *lungs* are sometimes found gorged with blood, as in many cases of apoplexy. But this appearance is not more constant than congestion in the brain. Perhaps they are more usually turgid when death is preceded by convulsions.

527. The *stomach* is occasionally red, and is said in one case to have been inflamed. But even

redness is rare, and decided inflammation probably never occurs. In the cases examined, the villous coat was quite healthy.

528. *Lividity of the skin* is almost always present, more or less, and sometimes it is excessive.

529. It has been said that the blood is always fluid. This certainly appears to be very generally the case; but at the same time this condition of the blood is not invariable. In a case on record, it was coagulated in the left cavities of the heart; in another, there were clots in both ventricles; and in a third, a large fibrinous concretion was found in the heart, clearly showing that the blood had coagulated after death as usual.

530. It appears that the body is often apt to pass rapidly into putrefaction. In a case examined, although the body had been kept only thirty hours in a cool place in the month of December, the cuticle was easily peeled off, the joints were flaccid, and an acid smell was exhaled. A still more pointed case is that of a lady, who died seven hours after taking a large quantity of laudanum by mistake, and whose body was so far gone in putrefaction, fourteen hours after death, that the dissection could not be delayed any longer. The hair and cuticle separated on the slightest friction, and the stomach, intestines, and large vessels were distended with air. It is doubtful whether this be a constant appearance or not. In a case examined, the body was free from putrefaction forty-eight hours after death.

531. Although opium is generally believed to suspend all the secretions and excretions but the sweat, instances have been met with where a great collection of urine was found in the bladder after death.

532. In the examination of the dead body unequivocal evidence will sometimes be procured by the discovery of a portion of the poison in the stomach. But it must not always be concluded that opium has not been swallowed, because the sense of smell, chemical analysis, and experiments on animals fail to detect it. For the opium may not remain in the stomach after death; though a large quantity was swallowed, and not vomited. This may arise from two causes. It may be all absorbed, as will often happen when it has been taken in the liquid form: or it may be partly absorbed and partly decomposed by the process of digestion.—But in one or other of these ways it may certainly disappear, and that in a very few hours only. At the same time there is no doubt that the poison may sometimes be found in the stomach.

SECT. III.—*Of the Action of Morphia, Narcotine and Meconic Acid.*

533. The action of *Morphia*,* is nearly the same as that of opium, but more energetic. In its solid state it has little effect, being nearly insoluble.—But when dissolved in olive oil, or in alcohol, or

---

* The chemical preparations of morphia, used in medicine are, the acetate, citrate, sulphate and muriate of morphia.

in the acids, particularly the acetic, it excites in animals the same symptoms as opium.

534. On man, morphia acts like opium; it produces somnolency. It was at one time thought that in medicinal doses it does not produce either the disagreeable subsequent, or the idiosyncratic effects of opium. Others, however, have doubted this, and opposite results appear to have been procured by some.

535. The effects of morphia on man in fatal doses have hitherto been observed in a few cases only. The prevailing symptoms appear to be, pricking in the eyes with dimness of vision, and intense itching of the skin. This last affection has been considered an invariable symptom of the operation of morphia, even in medicinal doses.*

536. The effects of *Narcotine* on man have not been much inquired into. It appears to be but a feeble poison. Two grains, dissolved in olive oil, produced merely slight transient headache; eight grains, dissolved by means of muriatic acid, had no effect at all; and the same quantity of solid narcotine occasioned temporary headache, and in twenty-eight hours a singular state of excitement, with

---

* *Treatment of Poisoning with Morphia.*—Orfila recommends as an antidote the infusion or tincture of galls, which throws down a copious precipitate of a tanno-gallate of morphia having little or no activity on the animal system. The best method of using this antidote, is, as suggested by Dr. Thomson, to introduce a decoction of any astringent vegetable with the stomach-pump.

trembling of the hands, restlessness, and inability to fix the thoughts on any subject. These effects went off in a few hours.

537. *Meconic acid* is inert.[*]

538. It has been recently stated that iodine, chlorine, and bromine are all *antidotes* for poisoning with the vegetable alkaloids. (704.)

SECT. IV. *Of Poisoning with Hyoscyamus, Lactuca and Solanum.*

539. Of the narcotic poisons none bear so close a resemblance to opium, in its properties, as the *Hyoscamus* or henbane. Several species are poisonous. The juice or extract of *H. niger*,—procured from the leaves, stems, and especially the root,—produces, in animals, a state of sopor much purer than that caused by opium. The properties of the plant are concentrated in a peculiar alkaloid, which has been named *hyoscyama.*

540. Its energy, as a poison, seems to be influenced by season and vegetation. The root is the most active part of the plant; but in the spring it is almost inert. Thus the juice of three pounds of the root, collected near the end of April, when the plant has hardly begun to shoot, killed a dog in somewhat less than two days; while a decoction

---

[*] The action of *Narcein* and *Meconin,* two proximate principles more recently discovered in opium, has not been as yet investigated. But as the latter possesses a degree of acrimony, it is probable that it will prove to exert some marked action upon the animal system.

of an ounce and a half, collected on the last day of June, when the plant was in full vegetation, proved fatal in two hours and a half. The seeds are also poisonous; indeed the whole plant is so.

541. In medicinal doses, hyoscyamus commonly induces pleasant sleep; but it has been known to cause headache, delirium, nausea, vomiting, and feverishness.

542. In poisonous doses it causes loss of speech, dilatation of the pupil, coma, and delirium, generally of the unmanageable, sometimes of the furious kind. It has very rarely caused any symptoms of irritant poisoning; although an instance is mentioned of its having produced burning in the stomach, intense thirst, watching, delirium, depraved vision, and next a crowded eruption of dark spots and vesicles, which disappeared on the supervention of a profuse diarrhœa.

543. The accidents occasioned by henbane have commonly arisen from the individuals confounding the root with that of the wild chicory, or with the parsnip, to the latter of which it bears a considerable resemblance.

544. Of the other species of the hyoscyamus, the *H. albus* has been known to cause symptoms precisely the same with those above described.—Three other species, the *H. aureus*, *physaloides*, and *scopolia* are equally deleterious.*

---

* *Treatment of Poisoning with Hyoscyamus.*—Vinegar has been recommended as an antidote; but Dr. Thomson remarks, that from the action of the *alkalies,* he is disposed to

545. The *Lactuca virosa* and the *lettuce opium*, or extract of the *L. sativa*,[*] are allied in effects, but greatly inferior in power to opium and hyoscyamus. Three drachms of the extract of *L. virosa*, introduced into the stomach of a dog, killed it in two days, without causing any remarkable symptom; two drachms, applied to a wound in the back, induced giddiness, slight sopor, and death in three days; thirty-six grains, injected in a state of solution into the jugular vein, caused dullness, weakness, slight convulsions, and death in eighteen minutes. This poison, therefore, like other narcotics, acts through absorption. But it is far from being energetic.

546. Different species of the *Solanum*, a genus of the same natural order as the hyoscyamus, have been considered to possess the same properties, though in a much feebler degree. The *S. dulcamara*, or bitter-sweet, has been erroneously believed by some to possess distinct narcotic proper-

---

place more confidence on them. The first step, however, is to evacuate the stomach; after which the system is to be roused by ammonia and cordials.

[*] *L. sativa*, or common lettuce, belongs to the order Cichoraceæ. The plants of this order yield usually a milky, bitter, astringent, and narcotic juice; but before this narcotic bitter secretion is formed, many of the species are useful articles of food, as the succory and endive, when blanched, and the scorzonera and tragopogon, or salsafy. The lettuce opium, which is the juice of the common garden lettuce furnished during the time of fructification, is described in the Materia Medica, under the name of *tridax* or *lactucarium*.

ties. The extract of the *S. nigrum*, or common nightshade, possesses nearly the power and energy of lettuce opium. The *S. fuscatum* is rather more active, fifteen berries having caused hurried breathing and vomiting. The *S. mammosum* is also probably an active species, the capsule of the berries having been known to excite vomiting, giddiness, and confusion of mind. The *S. nigrum* and *dulcamara* yield a peculiar alkaloid, which induces somnolency in animals, but is not a very active poison.

547. Violent effects have often been assigned to this genus of plants, in consequence of its similarity to a powerful poison, the *Atropa belladona*; (622;) which indeed has been described by the older authors under the name of *Solanum furiosum*.*

---

* *Hyoscyamus* and *Solanum*, belong to the Solaneæ or nightshade tribe; for the essential botanical characters and general properties of which, see note to (621.) Under the present section may be mentioned an exotic and an indigenous plant belonging to the order *Papaveraceæ*, or poppy tribe: the essential characters of which order are:

"*Sepals* two, deciduous. *Petals* hypogenous, either four, or some multiple of that number, placed in a cruciate manner. *Stamens* hypogenous, either eight, or some multiple of four, generally very numerous, inserted in four parcels, one of which adheres to the base of each petal; *anthers* two celled, innate. *Ovarium*, solitary; *style* short, or none; *stigmas* alternate with the placentæ, two or many; in the latter case stellate upon the flat apex of the ovarium. *Fruit* one celled, either pod-shaped, with two parietal placentæ, or capsular, with several placentæ.—*Seeds*, numerous; *albumen* between fleshy and oily; *embryo*

Sect. V.—*Of Poisoning with Hydrocyanic Acid.*

1. *Of the Action of Hydrocyanic Acid and the Pathological Symptoms it excites in Man.*

548. Of all the forms in which the prussic or hydrocyanic acid can be administered, that of vapor appears the most instantaneous in operation. The effects of the diluted acid are the same when the dose is very large, but somewhat different when inferior doses are given.* It acts probably even through the sound skin.

minute, straight at the base of the albumen, plano convex cotyledons. *Herbaceous plants* or *shrubs*, with a milky juice. *Leaves* alternate more or less divided. *Peduncules* long, one-flowered; *flowers* never blue."—Lind. The narcotic properties of the poppy are well known, and this character prevails generally in the order. The narcotic principle exists principally in the capsules. Those of the *Argemone Mexicana*, or prickly poppy, a plant which has been lately introduced into this country, are said to be more strongly narcotic than opium. The *Sanguinaria canadensis*, (puccoon, blood root,) also belongs to this order. It contains an alkaline principle which has received the name of *Sanguinaria;* but its medicinal properties are not yet well understood. The root of the puccoon is represented by Dr. Bigelow to be a narcotic-acrid. Accordingly taken in large doses, it produces nausea, heat in the stomach, faintness, and often vertigo and indistinct vision, and finally emesis.

The leaves and berries of the yew-tree (*Taxus bacata*) are poisonous, and usually classed among the narcotics.

* The anhydrous hydrocyanic acid is seldom if ever found in the shops. The medicinal acid is equivalent to about one part of strong acid to six parts by volume of water, the dose of which is from two to eight drops, further diluted with distilled water.

549. The result of some experiments favor the supposition that hydrocyanic acid acts through the medium of the blood vessels. But the extreme rapidity of its operation in large doses, is usually considered incompatible with an action through the blood, or any other channel except direct conveyance along the nerves. It acts on the brain, and also on the spine, independently of its action on the brain. Its action on both is clearly indicated by the combination of coma with tetanus.

550. Hydrocyanic acid affects all animals indiscriminately. From the highest to the lowest in the scale of creation, all are killed by it; and all perish nearly in the same manner. It is poisonous in all its chemical combinations.*

551. As for the symptoms observed in man, the following is a good account of the effects of small doses, as ascertained by *Coullon* on himself. When he took from twenty to eighty-six drops of the diluted acid, he was attacked for a few minutes with nausea, salivation, hurried pulse, weight and pain in the head, succeeded by a feeling of anxiety, which lasted about six hours. Such symptoms are apt to be induced by too large medicinal doses.—Another remarkable symptom, which has been

---

* Cyanuret of potassium dissolved in eight times its weight of distilled water, forms the medicinal *Hydrocyanate of potassa*, which is the only combination of the acid employed; it is administered in the same doses as the hydrocyanic acid. The *pectoral julep* and *pectoral mixture*, of Magendie's Formulary, are prepared with the hydrocyanate of potassa. The same author mentions also a *Syrup* of *hydrocyanate* of *potassa*.

sometimes observed during its medicinal use, is salivation, with ulceration of the mouth.*

552. Of the operation of the poison when not quite sufficient to kill, the case of a French physician will convey a good idea. Very soon after swallowing a tea spoonful of the diluted acid he felt confusion in the head, and soon fell down insensible, with difficult breathing, small pulse, bloated countenance, dilated insensible pupils, and locked-jaw. Afterwards, he had several fits of tetanus, one of them extremely violent. In two hours and a half he began to recover his intellects, and rapidly became sensible; but for some days he suffered much from ulceration of the mouth and violent pulmonary catarrh, which had evidently been excited by the ammonia given for the purpose of rousing him. This gentleman had eructations with the odor of the acid three or four

---

* Dr. Christison makes this assertion upon the authorities of Drs. Macleod and Granville. The former gentleman thrice had occasion to remark this in patients, who had been using the acid for about a fortnight, and twice in one individual; and Dr. Granville says he had also twice witnessed the same effect. Nevertheless it is suspected that salivation in these cases has been brought about by the use of an impure acid, containing probably a small quantity of the deuto-chloride of mercury, particularly if the acid had been prepared according to the process of the Dublin college, namely, with bicyanide of mercury, *muriatic acid*, and water. In fact, we are informed by our colleague, Dr. E. Geddings, that in other cases, where salivation has likewise been produced apparently by the use of hydrocyanic acid, mercury was actually discovered in the acid by Sylvester's test.

hours after he took it; and during the earlier symptoms the same odor was exhaled by his breath.

553. As to the effects of fatal doses, it is probable that in man, as is found to be the case in animals, two varieties exist. When the dose is very large, it is reasonable to suppose that death will take place suddenly, without convulsions. But for obvious reasons the symptoms in such cases have not been hitherto witnessed.

554. The most complete account of the symptoms from fatal doses when convulsions occur, is given in a case reported by *Hufeland*, of a man, who, when apprehended for theft, swallowed an ounce of alcoholised acid, containing about forty grains of the pure acid. He was observed immediately to stagger a few steps, and then to sink down without a groan, apparently lifeless. A physician, who instantly saw him, found the pulse gone and the breathing for some time imperceptible. After a short interval, he made so forcible an expiration, that the ribs seemed drawn almost to the spine. The legs and arms then became cold, the eyes prominent, glistening, and quite insensible; and after one or two more convulsive expirations, he died, five minutes after swallowing the poison.

555. The period within which hydrocyanic acid usually proves fatal, is fixed with considerable accuracy, not only by the cases observed in the human subject, but likewise by the experiment

of many physiologists. It is probable that very large doses occasion death in a few seconds; and at all events, a few minutes will suffice to extinguish life when the dose is considerable; but if the individual *survive forty minutes*, he will generally recover under active treatment. In the course of a dreadful accident, which lately happened in one of the Parisian hospitals, where seven epileptic patients were killed at one time by too large doses of the medicinal acid, it was found that several did not die for forty-five minutes.

2. *Of the Treatment of Poisoning with Hydrocyanic Acid.*

556. The only remedies which appear to promise any material advantages in cases of poisoning with hydrocyanic acid are the powerful and diffusive stimulants.

557. Of these, *ammonia* is considered by many the most energetic antidote. But it must be administered with this caution—not to use a strong ammoniacal liquor, otherwise, the mouth, air-passages, and even the alimentary canal may be attacked with inflammation, as indeed happened to the French physician, whose case is mentioned, (552.) The strong *aqua ammonia* should be diluted with twelve parts of water.

558. Another remedy of the same kind with ammonia, as to action, is *chlorine*. *Orfila* infers from his experiments, that it is the most powerful antidote of all that have been proposed. His ex-

periments have convinced him, that animals, which have taken a dose of poison, sufficient to kill them in fifteen or eighteen minutes, will be saved by inspiring water impregnated with a fourth part of its volume of chlorine, even, although the application of the remedy be delayed till the poison has operated for four or five minutes. In some of his experiments, he waited till the convulsive stage of poisoning was passed, and the stage of flaccidity and insensibility had supervened; yet the animals were obviously out of danger ten minutes after the chlorine was first applied, and recovered entirely in three quarters of an hour.*

559. *Cold affusion* has been recommended.—When the dose of the poison was insufficient to prove fatal in ordinary circumstances, two affusions were found commonly sufficient to dispel every unpleasant symptom. When the dose was larger, it was necessary to repeat the affusion more frequently. Its efficacy was always most certain, when it was resorted to before the convulsive stage of the poisoning was over; yet, even

---

* According to Dr. Thomson, chlorine so completely neutralises the action of the hydrocyanic acid, that, in one instance, when respiration had been suspended for twenty-five seconds, and the animal apparently dead, it was rapidly revived by the chlorine, and in a short time recovered its usual vivacity.—When the acid has been swallowed, the chlorine may be given in the ordinary aqueous solution; when the poisonous effects have resulted from inhaling the vapor of the acid, the chlorine is to be administered in the gaseous form, largely diluted with atmospherical air.

in the stage of insensibility and paralysis, it was sometimes employed with success. In the latter instance, the first sign of amendment was renewal of the spasms of the muscles. The cold affusion is considered, however, to be inferior in power to chlorine.

560. On the whole, then, it appears that the proper treatment of a case of poisoning with hydrocyanic acid, consists in the use of the cold affusion, and the inhalation of diluted ammonia or chlorine; and as chlorine will hardly ever be at hand, ammonia will commonly be employed. *Venesection* is also probably indicated by the signs of congestion in the head.

3. *Of the Morbid Appearances produced by Hydrocyanic Acid.*

551. Under this head it is first to be remarked, that the *blood* is generally altered in nature. It has been found perfectly fluid every where in the human subject. But this state is not invariable. Some cases are mentioned in which the blood coagulated after flowing from the body; and in one instance it was found coagulated in the heart.

562. In the next place, it is observed, that the blood and cavities of the body in animals exhale a hydrocyanic odor, even though the quantity taken was small. The blood did so in the heart as well as throughout the whole body, in cases mentioned of the human subject. The odor, however, is not always present; and it appears that it may be dis-

tinct in the blood, brain, or chest, when hardly any is to be perceived in the stomach.

563. As to the circumstances under which the hydrocyanic odor may or may not be expected, it is stated, that if the dose is sufficient to cause death within ten minutes, the peculiar odor will always be remarked in the blood of the heart, lungs, and great vessels, provided the body have not been exposed to rain or to a current of air, and the examination be made within a moderate interval—for example, twenty-one hours for so small an animal as a dog; but that, if the dose is so small that life is prolonged for fifteen, twenty-seven, or thirty-two minutes, then even immediately after death it may be impossible to remark any of the peculiar odor, evidently because the acid is rapidly discharged by the lungs; and that even when the dose is large enough to cause death in four minutes, the smell may not be perceived if the carcass has been left in a spacious apartment for two days, or exposed to a shower for a few hours only.

564. Venous turgescence and emptiness of the arterial system, is commonly remarked throughout the whole body. Thus, in the epileptic patients, (555,) the heart and great arteries were empty; the great veins gorged; the spleen gorged, soft and pultaceous; the veins of the liver gorged; and the kidneys of a deep violet color, much softened, and their veins gorged with black blood.

565. It is impossible that hydrocyanic acid could cause gangrene of the *stomach*, which is said to

have been witnessed in one case. But there are often signs of irritation in that organ. The villous coat has been found red in animals; it was shrivelled, and its vessels were turgid with black blood in a case related of a human subject; in another it was red and checkered with bloody streaks; and in a third case, where four ounces were swallowed, it was dark-red, as though it were tanned or steeped in spirits, and easily separated from the subjacent coats.

566. It appears that even long after death the *eye* has a peculiar glistening and staring expression, so as to render it difficult to believe that the individual is really dead; and this appearance has been considered as a decisive evidence of poisoning by hydrocyanic acid. But the accuracy of this opinion may be questioned. The appearance is indeed very general in cases of poisoning with preparations that contain the hydrocyanic acid.—But, on the one hand, it is not a constant appearance, for it was not observed in the seven Parisian epileptics. And, on the other hand, it is not peculiar, for death from carbonic acid has the same effect; (603;) and it has been observed in cases of death from cholera, and during the epileptic paroxysm.

SECT. VI. *Of Poisoning with the Vegetable Substances containing Hydrocyanic Acid.*

567. The plants which have been thoroughly examined and found to yield hydrocyanic acid,

belong to the division *Pomaceæ* of Jussieu's natural family *Rosaceæ*. These are the bitter-almond, cherry-laurel, bird-cherry, peach, and mountain-ash or rowan-tree.* The poison procured from them exists in two forms—as a distilled water, and as an essential oil.

1. *Of Poisoning with the Bitter-Almond.*

568. The bitter-almond was once extensively used in medicine, and is still very much employed by confectioners for flavoring puddings, sweet-

---

* In point of botanical accuracy, Dr. Christison is wrong in referring the plants enumerated above to the order *Pomaceæ*. They all belong, with the exception of the mountain-ash, to the *Amygdaleæ* or almond tribe, eminently distinguished from the *Rosaceæ* and *Pomaceæ* by the presence of hydrocyanic acid both in their leaves and in the kernel of their fruits. The essential characters of this order of plants, are: "*Calyx*, five-toothed, deciduous, lined with a disk; the fifth lobe next the axis. *Petals* five, perigynous. *Stamens* twenty, or thereabouts, arising from the throat of the calyx, in æstivation curved inwards; *anthers* innate, two-celled, bursting longitudinally. *Ovary* superior, solitary, simple, one-celled; *ovula* two, suspended; *styles* terminal, with a furrow on one side, terminating in a uniform *stigma*. *Fruit*, a drupe, with the putamen sometimes separating spontaneously from the sarcocarp. *Seeds* mostly solitary, suspended, in consequence of the cohesion of a funiculus umbilicalis, arising from the base of the cavity of the ovarium, with its side. *Embryo* straight, with the radicle pointing to the hilum; *cotyledons* thick; *albumen* none. *Trees* or *shrubs*. *Leaves* simple, alternate usually glandular towards the base; *stipulæ* simple, mostly glandular. *Flowers* white or pink. *Hydrocyanic acid* present in the leaves and kernel."

meats, and liquors. It is the kernel of the fruit of the *Amygdalus communis.* This species has two varieties, the *dulcis* and the *amarus;* which differ from one another in the fruit only. The fruit of the former yields the sweet, and of the latter the bitter almond.

569. The bitter almond depends for its activity on the essential oil, which is common to all the vegetable poisons belonging to the present tribe. This essential oil contains hydrocyanic acid, and is not much inferior in activity to the pure acid.

570. In small doses the bitter almond produces disorder of the digestive organs, nausea, vomiting, and sometimes diarrhœa. These symptoms are occasionally brought on by the small quantities used for flavoring sweetmeats, particularly when the confectioner has not been careful in compounding them.

571. In peculiar constitutions the minutest quantity, even a single almond, will cause a state resembling intoxication, succeeded by an eruption like nettle-rash.

572. The following affords an instance of death in the human subject occasioned by bitter-almonds. A bath-woman gave her child the expressed juice of a handful of bitter almonds to cure worms. The child, who was four years old, was immediately attacked with colic, swelling of the belly, giddiness, locked-jaw, frothing at the mouth, general convulsions, and insensibility, and died in two hours.

573. A fatal case of poisoning with the oil is thus related. A hypochondriacal gentleman, forty-eight years old, swallowed two drachms of the essential oil. A few minutes afterwards, his servant, whom he sent for, found him lying in bed, with his features spasmodically contracted, his eyes fixed, staring, and turned upwards, and his chest heaving convulsively and hurriedly. A physician, who entered the room twenty minutes after the draught had been taken, found him quite insensible, the pupils immoveable, the breathing stertorous and slow, the pulse feeble, and only thirty in a minute, and the breath exhaling strongly the odor of bitter-almonds. Death ensued ten minutes afterwards.

574. The *morbid appearances* are the same as poisoning with the pure acid, (561, 566.) In the case reported (573) the whole blood and body emitted a smell of almonds; putrefaction had begun, though the inspection was made twenty-nine hours after death; the blood throughout was fluid, and flowed from the nostrils and mouth; the veins were every where turgid; the cerebral vessels gorged; the stomach and intestines very red.

2. *Of Poisoning with the Cherry-Laurel.*

575. The cherry-laurel, or *Prunus lauro-cerasus*, yields a distilled water and an essential oil, which is found to have all the chemical properties of the oil of bitter-almond.

576. Cherry-laurel oil contains hydrocyanic acid, but less in quantity than the oil of bitter-

almonds. It is probably, therefore, a weaker poison. Sixteen drops put on the tongue of rabbits killed them in nine, fifteen or twenty minutes; and ten or twelve drops injected in oil into the arms produced death in four minutes. The symptoms were slow breathing, palsy of the hind-legs, then general convulsions; and death was preceded by complete coma. A very extraordinary appearance was found in the dead body—blood extravasated abundantly in the trachea and lungs.

577. The cherry-laurel water, prepared by distillation from the leaves of this plant, was long the most important of the poisons which contain the hydrocyanic acid, as it was the most common before the acid itself was introduced into medical practice. From experiments on animals, by a great number of observers, it appears, that, whether it is introduced into the stomach, or into the anus, or into the cellular tissue, or directly into a vein, it occasions giddiness, palsy, insensibility, convulsions, coma, and speedy death,—that the tetanic state brought on by the pure acid, is not always so distinctly caused by cherry-laurel water,—and that tetanus is most frequently induced by medium doses.

578. As to its effects on man, in most of the cases related, the individuals suddenly lost their speech, fell down insensible, and died in a few minutes.—Convulsions do not appear to have been frequent. An instance is related where a child seems to have

been killed by the leaves applied to a large sore on the neck.

579. The appearances found in the dead body have varied. In general the blood has been fluid. The smell of the bitter almond has commonly been distinct in the stomach.*

3. *Of Poisoning with the Peach, Cluster-cherry, and some other Plants of the same natural order.*

580. The *Amygdalus persica*, or peach, is the most active of the other plants mentioned in this section, which yield hydrocyanic acid. Most parts of the plant exhale the odor of the bitter-almond, but particularly the flowers and kernels. The fresh young shoots collected in July, contain,

---

* The Mountain laurel, (*kalmia latifolia,*) also called calico bush, though not naturally included in the above section, may with some propriety be noticed in this place. This N. American shrub belongs to the order Ericeæ, or Heath tribe. A decoction of the leaves is said to be used by our Indians, for the purposes of self-destruction. It has also been asserted that the flesh of the Grous, (Tetrao cupido,) and that of the quail or partridge, (Perdix Virginiana,) become poisonous from feeding upon the buds of this plant: but this has been denied by the celebrated ornithologist, Wilson. Cattle and sheep that feed upon the leaves of the kalmia, are frequently poisoned by them, and this effect is ascribed by Dr. Bigelow, to the indigestible nature of the resin which they abundantly contain.

The *Rhododendron chrysanthemum,* and *ferrugineum* belong to the same order. Their leaves have an astringent, bitterish taste, and are stimulant, narcotic and diaphoretic.

weight for weight, even more essential oil than bitter-almond, or cherry-laurel leaves.

581. The following affords a fatal case of poisoning with the peach-blossom. A child, eighteen months old, after taking a decoction of flowers, to destroy worms, perished with frightful convulsions, efforts to vomit, and bloody diarrhœa. The peach-blossom would therefore appear to be rather a narcotico acrid, than a pure narcotic.

582. The distilled water from the bark of the *Prunus padus*, or cluster-cherry, has the odor of bitter-almonds, contains the same essential oil with that of the bitter-almond, and yields more hydrocyanic acid than the cherry-laurel water. The fruit is also poisonous. It has a nauseous taste, but communicates a pleasant flavor to spirituous liquors.

583. The *Prunus avium*, or black-cherry or mazzard, the *P. insititia*, or bullace, the *P. spinosa*, or sloe, the *Amygdalus nana*, or dwarf almond, and even the leaves and kernels of the common cherry, the *Prunus cerasus*, possess similar, though weaker properties.* It is also probable that the seeds of the *pomaceæ*, such as even the seeds of the apple and pear, have the

---

* The wild cherry, (*Prunus Virginianus*,) a very common and large tree of our forest, affords in the bark of its trunk and root a remedial agent of some value. This bark, is said by Dr. Cornwell, to contain a crystaline principle, which he has called *cerasia*. It also contains hydrocyanic acid, upon which its remedial properties depend. The bark of the root is stronger than that of the trunk.

same qualities, for they have the same odor and taste; but they have not been particularly examined.

4. *Of Poisoning with the Mountain Ash.*

584. The *Sorbus aucuparia*, mountain ash or rowan tree, as it is called in Scotland, has been lately added to the list of plants which abound in the same poisonous principle. Many parts of this tree, such as the flowers and the bark of the trunk and branches, contain more or less of the peculiar essential oil. The root in particular contains so much in the month of May, as to smell strongly of it when broken across, and yields a distilled water which holds fully as much hydrocyanic acid as that procured from an equal weight of cherry-laurel leaves.

SECT. VII.—*Of Poisoning with the Narcotic Gases.*

585. The group of narcotic gases includes sulphuretted-hydrogen, carburetted-hydrogen, carbonic acid, carbonic oxide, cyanogen, and oxygen.

1. *Of Poisoning with Sulphuretted-hydrogen Gas.*

586. Sulphuretted-hydrogen is the most deleterious of all the gases. Air, impregnated with a fifteenth hundredth part of the gas, kills birds in a short space of time; and with about twice that proportion, or an eight-hundredth, it will soon kill a dog. In moderate quantity it proves quickly fatal, whether inhaled or injected into the cel-

lular tissue, stomach, or anus, or simply applied to the skin.

587. The symptoms on man, in cases where the vapors are breathed in a state of concentration, are sudden weakness, and all the signs of ordinary asphyxia. The individual becomes suddenly weak and insensible; falls down; and either expires immediately, or, if he is fortunate enough to be quickly extricated from the poisonous atmosphere, he may revive in no long time, the belly remaining tense and full for an hour or upwards, and recovery being preceded by vomiting and hawking of bloody froth. When the noxious emanations are less concentrated, several affections have been noticed, which may be reduced to two varieties, the one consisting of pure coma, the other of coma and tetanic convulsions.

588. In the comatose form, the patient seems to fall gently asleep, is roused with difficulty, and has no recollection afterwards of what passed before the accident.

589. The convulsive form is sometimes preceded by noisy and restless delirium, sometimes by sudden faintness, heaving or pain in the stomach, and pains in the arms, and almost always by difficult breathing, from weakness in the muscles ot the chest. Insensibility, and a state resembling asphyxia, rapidly succeed, during which the pupil is fixed and dilated, the mouth filled with white or bloody froth, the skin cold and the pulse feeble and irregular. At last, convulsive efforts to breathe

ensue; these are followed by general tetanic spasms of the trunk and extremities; and if the case is to prove fatal, which it may not do for two hours, a state of calm and total insensibility precedes death for a short interval.

590. When the exposure has been too slight to cause serious mischief, the individual is affected with sickness, colic, imperfectly defined pains in the chest and lethargy.*

591. These extraordinary accidents may be occasioned not only by exposure to the vapors from the *fosses*,† but likewise by the incautious inhalation of the vapors proceeding from the bodies of persons who have been asphyxiated there. Sickness, colic, and pains in the chest, are often caused in the latter mode; and an instance is given of the most violent form of the convulsive affection having originated in the same manner.

592. The appearances in the bodies of persons killed by these emanations, are fluidity and blackness of the blood, a dark tint of all the internal vascular organs, annihilation of the contractility of the muscles, more or less redness of the bronchial tubes, and secretion of brown mucus there

---

* The noxious properties of an atmosphere partially loaded with sulphuretted-hydrogen, are speedily neutralized by the disengagement of chlorine gas.

† The name given to the Parisian privies, in which the gas, or rather the noxious exhalation, which is chiefly a mixture of ammonia and sulphuretted-hydrogen, is abundantly generated.

as well as in the nostrils, gorging of the lungs, an odor throughout the whole viscera like that of decayed fish, and a tendency to early putrefaction. It has also been remarked in animals, that when a plate of silver, or bit of white lead, was thrust under the skin, it was blackened.

593. Workmen ought to be aware that sulphuretted hydrogen may be quickly fatal where lights burn with *undiminished* brilliancy; and that, in places where it is apt to accumulate, the degree of purity of the air may vary so much in the course of working, as to be wholesome only a few minutes before, as well as a few minutes after a fatal accident.

594. The presence of sulphuretted hydrogen is best proved by exposing to the noxious emanations a bit of filtering paper, moistened with a solution of lead.*

---

* *Treatment of Poisoning by sulphuretted hydrogen.* Cold affusions, principally on the chest, seem to have produced the best results. Artificial respiration must also be resorted to; and if the patient revive, stimulants should then be administered. Solution of chlorine would doubtless prove beneficial:

Dr. Broughton concludes from his experiments, "that the gas enters into the circulation by the lungs, and that passing through the brain it suspends the cerebral functions without directly destroying the spontaneous action of the involuntary muscles, the heart continuing to act after the suspension of animal life and the cessation of the diaphragm and lungs, and the left ventricle distributing dark-coloured blood through the body. The absorption of the gas itself thus appears to act like a subtle poison; and as in cases of mere exclusion of com-

2. *Of Poisoning with Carburetted Hydrogen.*

595. Of the several species of carburetted hydrogen gas, it is probable that all are more or less narcotic; but they are much inferior in energy to sulphuretted hydrogen.

596. In regard to all the carburetted hydrogen gases, it is found that their effects are greatly impaired by moderate dilution with air.

597. The mixed gases of coal and oil-gases appear likewise to be inert when considerably diluted. It would seem, however, that when the impregnation is carried a certain length, poisonous effects may ensue; and that the symptoms then induced are purely narcotic.

3. *Of Poisoning with Carbonic Acid Gas.*

598. Carbonic acid gas is by far the most important of the deleterious gases; for it is the daily source of fatal accidents. It is extricated, in great quantity, from burning fuel; it is given out abundantly in the calcining of lime; it is disengaged in a state of considerable purity in brew-houses by

mon oxygenated air, when respiration is suspended for a longer period, the speedy restoration of the action of the diaphragm and lungs, and the introduction of atmospheric air, appear to offer the surest method of recovery; and the substitution of warmth and friction for the destructive use of tobacco injections and bleeding, is essential." In this view of the action of the gas, poisoning with sulphuretted hydrogen does not, properly speaking, destroy life by producing asphyxia.

the fermentation of beer; it is often met with in mines and caverns, particularly in coal-pits, and draw-wells; it may collect in apartments, where fuel is burnt without a proper outlet for the vitiated air, or where persons are crowded too much for the capacity of the room. Instances have even occurred of accidents from sleeping in green-houses during the night, when it is well known that plants exhale much carbonic acid.

599. When a man attempts to inhale pure carbonic acid gas, the nostrils and throat are irritated so strongly, that the glottis closes, and inspiration becomes impossible. It has been further remarked, that the gas causes an acid taste in the mouth and throat, and a sense of burning in the uvula. Hence when a person is immersed in the gas nearly or perfectly pure, as in a beer-vat or old well, he dies at once of suffocation.

600. The effects are very different when the gas is considerably diluted; for the symptoms then resemble apoplexy.

601. In a case related of poisoning with the gas diluted with air, the patient was first affected with violent and irregular convulsions of the whole body and perfect insensibility, afterwards with fits of spasm like tetanus; and during the second day, when these symptoms had gone off, he continued to be affected with dumbness.—It is worthy of particular remark that, contrary to general belief, these effects may be produced in situations where the air is not sufficiently impure to extinguish lights.

602. The fumes of burning charcoal have been long known to be deleterious. It appears that the first effects are slight oppression, then violent palpitation, and next confusion of ideas, gradually ending in insensibility. Tightness in the temples, and an undefinable sense of alarm, have also been remarked as the incipient symptoms; but others have, on the contrary, experienced a pleasing sensation that seduced them to remain on the fatal spot.

603. Occasionally the stage of stupor is followed, as in some other varieties of narcotic poisoning, by a stage of delirium, at times of the furious kind, or by a state resembling somnabulism. It does not follow that recovery is certain because coma has thus given place to delirium,—an alteration, which in most varieties of narcotic poisoning, is considered a sure sign of recovery.

604. The narcotism induced by breathing charcoal fumes, often lasts a considerable length of time,—much longer indeed than the effects of other narcotic poisons.

605. It is probable that in some circumstances a very small quantity of the mixed gases proceeding from the slow combustion of tallow and other oily substances, will produce dangerous symptoms. The emanations from the burning snuff of a candle, are probably of the same nature, and are very poisonous. An instance indeed has been recorded in which they proved fatal. The effects of such emanations are probably owing to an empyreumatic volatile oil (788.)

606. The vapors from burning coal are the most noxious of all kinds of emanations from fuel, and cause peculiar symptoms. But they are less apt to lead to accidents than the vapor of charcoal, as they are much more irritating to the lungs. This effect depends on the sulphurous acid gas, which is mingled with the carbonic acid.*

607. *The treatment of poisoning with carbonic acid* consists chiefly in the occasional employment of the cold affusion and in moderate blood-letting either from the arm or from the head. Cupping from the nape of the neck has been resorted to with great success. An instance is mentioned where blood-letting was singularly successful, and which deserves particular mention, because for three hours the patient remained without pulsation in any artery and without the slightest perceptible respiration. At first, neither by cupping nor by venesection could any blood be obtained; and it was only after the long interval just mentioned and the constant artificial inflation of the lungs, that the blood at length trickled slowly from the arm. The pulse and breathing were after this soon re-established; but it was not till eight hours later that sensibility returned.

608. The morbid appearances left in the body

---

*This paragraph refers to the burning of *bituminous coal;* the sulphurous gas being produced by the combustion of the sulphur, or decomposition of the pyrites, which it frequently contains. *Anthracite* coal, yields while burning, nothing but carbonic oxide and carbonic acid.

after poisoning with carbonic acid gas, have been chiefly observed in persons killed by charcoal vapor. The vessels of the brain are gorged, and the ventricles contain serum, the lungs are distended, as if emphysematous; the heart and great veins are distended with black fluid blood; the eyes are generally glistening and prominent, the face red, and the tongue protruded and black. Gorging of the cerebral vessels seems to be very common.—The countenance is always composed, but generally livid. The body usually remains flaccid, and the customary stage of rigidity is imperfect. In some instances, however, the stage of rigidity is passed through in the usual manner.

4. *Of Poisoning with Carbonic Oxide Gas.*

609. Carbonic oxide gas, certainly appears to be very deleterious when breathed by man. A person, having previously exhausted his lungs, inhaled the pure gas three or four times, upon which he was suddenly deprived of sense and motion, fell down supine, and continued for half an hour insensible, apparently lifeless, and with the pulse nearly extinct. Various means were tried for rousing him, without success, till at last oxygen gas was blown into the lungs. Animation then returned rapidly: but he was affected for the rest of the day with convulsive agitation of the body, stupor, violent headache and quick irregular pulse; and after his senses were quite restored, he suffered from giddiness, blindness, nausea, alternate

heats and chills, succeeded by feverish, broken, but irresistible sleep.

5. *Of Poisoning with Nitrous Oxide Gas.*

610. The nitrous oxide or intoxicating gas when breathed by man, usually excites giddiness, a delightful sense of thrilling in the chest and limbs, acuteness of hearing, brilliancy of all surrounding objects, and an unconquerable propensity to brisk muscular exertion. These feelings are of short duration, and generally succeeded by alertness of body and mind, never by the exhaustion, depression and nausea, which follow the state of excitement brought on by spirits or opium. But these effects are by no means uniform. For others have been suddenly seized with great weakness, tendency to faint, loss of voice, and sometimes convulsions.

6. *Of Poisoning with Cyanogen Gas.*

611. Cyanogen gas has been proved to be an active poison to all animals. In the rabbit it was found to produce anxious breathing, slight convulsions, staring of the eyes, dilated pupils, coma, and death in five or six minutes. *Buchner* on one occasion remarked, whilst preparing the gas, that the fore finger which was exposed to the bubbles as they escaped, became suddenly benumbed, and that this effect was attended with a singular feeling of pressure and contraction in the joints of the thumb and elbow. It would undoubtedly be most

dangerous to breathe this gas except much diluted and in very small quantity.

7. *Of Poisoning with Oxygen Gas.*

612. Of all the narcotic gases none is more singular in its effects than oxygen. When breathed in a state of purity by animals, they live much longer than in the same quantity of atmospheric air. But if the experiment be kept up for a sufficient length of time, symptoms of narcotic poisoning begin to manifest themselves. For an hour, no inconvenience seems to be felt, but the breathing and pulse then become accelerated; a state of debility next ensues; at length, insensibility gradually comes on, with glaring of the eyes, slow respiration and gasping; coma is in the end completely formed; and death ensues in the course of six, ten or twelve hours. If the animals are removed into the air before the insensibility is considerable, they quickly recover.

613. When the body is examined immediately after death, the heart is seen beating strongly, but the diaphragm motionless; the whole blood in the veins as well as the arteries, is of a bright scarlet color; some of the membranous surfaces, such as the pulmonary pleura, have the same tint, and the blood coagulates with remarkable rapidity.—Death is probably owing to hyper-arterialization of the blood.

CHAPTER XI.

CLASS THIRD.

SECT. I. *Of the Narcotico-Acrid Poisons generally.*

614. The third class of poisons, the Narcotico-acrids, includes those which possess a double action, the one local and irritating, like that of the irritants, the other remote, and consisting of an impression on the nervous system.

615. Sometimes they cause narcotism; which is generally of a comatose nature, often attended with delirium; but in one very singular group there is neither insensibility nor delirium, but merely violent tetanic spasms.

616. At other times they excite inflammation where they are applied. This effect, however, is by no means constant. For under the name of narcotico-acrids several poisons are usually described which seldom excite inflammation. Those which inflame the tissues where they are applied, rarely occasion death in this manner. Some of them may produce very violent local symptoms; but they generally prove fatal through their operation on the nervous system.

617. For the most part, their narcotic and irritant effects appear incompatible. That is, when

they act narcotically, the body is insensible to the local irritation; and when they irritate, the dose is not large enough to act narcotically. In large doses, therefore, they act chiefly as narcotics, in small doses as irritants. Sometimes, however, the narcotic symptoms are preceded or followed by the symptoms of irritation; and more rarely both exist simultaneously.

618. Most, if not all, of them, to whatever part of the body they are applied, act remotely by entering the blood-vessels; but it has not been settled whether they operate by being carried with the blood to the part on which they act, or by producing on the inner membrane of the vessels a peculiar impression, which is conveyed along the nerves. Some of them produce direct and obvious effects where they are applied. Thus monk's-hood induces a peculiar numbness and tingling of the part with which it is placed in contact. The organs on which they act remotely, are the brain and spine, and sometimes the heart also.

619. The appearances in the dead body are, for the most part, inconsiderable; more or less inflammation in the stomach or intestines, and congestion in the brain; but even these are not constant.

620. The narcotico-acrids are all derived from the vegetable kingdom. Many of them owe their power to an alkaloid, consisting of oxygen, hydrogen, carbon, and a little azote.

SECT. II. *Of Poisoning with Nightshade, Thorn-Apple, and Tobacco.*

621. The first group of the Narcotico-acids comprehends the poisons whose principal symptom is delirium. All the plants of the group belong to the natural order *Solaneæ*,* and Linnæus's

---

* The essential characters of the Solaneæ, are:

"*Calyx* five-parted, seldom four-parted, persistent, inferior, *Corolla* monopetalous, hypogynous; the *limb* five-cleft, seldom four-cleft, regular or somewhat unequal, deciduous; the *æstivation* in the genuine genera of the order, plaited; in the spurious genera imbricated. *Stamens* inserted upon the corolla, as many as the segments of the limb, with which they alternate, one sometimes being abortive; *anthers* bursting longitudinally, rarely by pores at the apex. *Ovarium* two-celled, with two polyspermous placentæ; *style* continuous; *stigma simple*. *Pericarpium* with two or four cells, either a capsule with a double dissepiment parallel with the valves, or a berry, with the placentæ adhering to the dissepiment. *Seeds* numerous, sessile; *embryo* more or less curved, often out of the centre, lying in fleshy *albumen; radicle* next the *hilum*. Herbaceous plants or *shrubs*. *Leaves* alternate, undivided, or lobed; the floral ones sometimes double, and placed near each other. *Inflorescence* variable, often out of the axillæ; the *pedicles* with bracteæ." LIND.

Of the general properties of this order of plants it is remarked, that it would seem to offer at first sight an exception to the general uniformity which has been found to exist between structure and property—containing, as it does, the deadly nightshade and henbane, and the wholesome potato and tomato. The leaves of all the plants of this family are narcotic and exciting, but in different degrees, from the Atropa belladona, which causes vertigo, convulsions, and vomiting; the well-known tobacco, which will frequently produce the first class Pentandria monogynia. Those which have been particularly examined are deadly nightshade, thorn-apple, and tobacco.

1. *Of Poisoning with Deadly Nightshade.*

622. Of the deadly nightshade, or Atropa belladonna, the root is considered the most active part

and last of these symptoms; the henbane and stramonium, down to some of the Solanum genus, the leaves of which are used as kitchen herbs.—But in reference to this, it has been observed by the celebrated Decandolle, that we must not lose sight of the fact that all our aliments contain a small quantity of some exciting principle, which, were it to exist in a greater proportion, might be injurious, but which becomes necessary therein as a sort of natural condiment.—It is in the fruit that the greatest diversity of characters exists. Atropa belladonna, Solanum nigrum (546), and others are highly poisonous; Stramonium, Henbane, some Cestrums, and Physalis, are narcotic; the fruit of the Physalis Alkekengi is diuretic, for which quality it is employed by veterinary surgeons; that of Capsicum is pungent, or even acrid; some Physalis are subacid, and so wholesome as to be eaten with impunity; and finally, the egg-plant, *S. esculentum,* and all the tomato tribe of Solanum, yield fruits which are common articles of cookery. But it is stated that the poisonous species derive this property from the presence of a pulpy matter which surrounds the seeds; and that the wholesome kinds are destitute of this pulp, their fruit consisting only of what botanists call the *sarcocarp*—that is to say, the centre of the rind, in a more or less succulent state. Besides, if the fruit of the egg-plant is eatable, it only becomes so after undergoing a particular process, by which all its bitter acrid matter is removed; and the tomato *should* always be exposed to heat before it is eaten. In the United States it is customary to eat the tomato in its raw state, when it is decidedly unwholesome, to say the least of it.

of the plant. The juice of the leaves is very energetic, two grains of its extract being, when well prepared, a large enough dose to cause disagreeable symptoms in man. The berry is likewise poisonous.

623. The plant contains a peculiar alkaloid, the *Atropia*, in which all its active properties reside. The aqueous solution of its salts exhales during evaporation a narcotic vapour, which dilates the pupil, and causes sickness, giddiness, and headache.

624. The ordinary extract of belladona in the dose of half an ounce, will kill a dog in thirty hours when introduced into the stomach. Half that quantity applied to a wound will kill it in twenty-four hours; and forty grains injected into the jugular vein prove even more quickly fatal. Convulsions are rarely produced, but only a state like intoxication.

625. On man the effects are much more remarkable. In small doses, whatever be the kind of surface to which it is applied,—such as the skin round the eye, or the surface of a wound, or the inner membrane of the stomach, it causes dilatation of the pupil. This effect may be excited without any constitutional derangement. When the extract is rubbed on the skin round the eye, vision is not impaired; but when it is taken internally so as to affect the pupils, the sight is commonly much obscured.

626. The effects of large or poisonous doses have been frequently witnessed. From the cases

that have been published, the leading symptoms appear in the first instance to be dryness in the throat, then delirium with dilated pupils, and afterwards coma. Convulsions are rare, and, when present, slight.

627. The dryness of the throat is not a constant symptom. It is often, however, very distinct. It occurred, for example, in 150 soldiers who were poisoned near Dresden, and in six soldiers whose cases have been also described. The former had not only dryness of the throat, but likewise difficulty of swallowing.

628. The delirium is generally extravagant, and also most commonly of the pleasing kind, sometimes accompanied with immoderate, uncontrollable laughter, sometimes with constant talking, but occasionally with complete loss of voice, as in the case of the 150 soldiers. At other times the state of mind resembles somnambulism, as in the instance of a tailor who was poisoned with a belladonna injection; and who for fifteen hours, though speechless and insensible to external objects, went through all the customary operations of his trade with great vivacity, and moved his lips as if in conversation.

629. The pupil is not only dilated in all cases, but likewise for the most part insensible; and, as in the soldiers at Dresden, (626,) the eyeball is sometimes red and prominent. The vision also, as in these soldiers, is generally obscure; sometimes it is lost for a time; and so completely, that even the brightest light cannot be distinguished.

630. The sopor or lethargy, which follows the delirium, occasionally does not supervene for a considerable interval. In a case related, it did not begin till twelve hours after the poison was taken. Sometimes, as in the same case, the delirium returns when the stupor goes off; and very frequently the stupor is not distinct at any stage. Even the delirium is not always formed rapidly.

631. Convulsions, it has already been stated, are rare. In a case on record, the muscles of the face were somewhat convulsed; there is also at times more or less locked-jaw, or of subsultus tendinum; and occasionally much abrupt agitation of the extremities. But well-marked convulsions do not appear to be ever present.

632. The effects now detailed are by no means so quickly dissipated as those of opium. Almost every person who has taken a considerable dose has been ill for a day at least. The case alluded to (631) lasted three days, delirium having con tinued twelve hours, the succeeding stupor for nearly two days, and the departure of the stupor being attended with a return of delirium for some hours longer. A case is related in which the individual was comatose for thirty hours.

633. The blindness is also a very obstinate symptom, which sometimes remains after the affection of the mind has disappeared. In general, the dilated state of the pupils continues long after the other symptoms have departed. It further appears that dilated pupil is not the only symptom

which may thus continue, but that various nervous affections, such as giddiness, disordered vision, and tremors, may prevail even for three or four weeks.

634. Hitherto little or no mention has been made of symptoms of irritation as arising from this poison. They are in fact uncommon, and seldom violent. An instance of violent strangling with suppression of urine and bloody micturition is however related. In the early stages, the patient had redness of the throat, and burning along the whole alimentary canal, combined with the customary delirium and loss of consciousness. Nausea and efforts to vomit are not unfrequent at the commencement.

635. *Treatment of Poisoning with Belladonna.* If the accident is taken in time, poisoning with belladonna is rarely fatal; for as the state first induced is delirium, not sopor, suspicion is soon excited, and *emetics* may be made to act before a sufficient quantity of the poison has been absorbed to prove fatal.*

---

* Dr. Thomson states, however, that an overdose of belladonna produces such an effect on the stomach that it cannot be excited to vomiting by any emetics: hence he recommends the use of the stomach-pump. He also advises the administration of alkalies to decompose the malate of atropia that may remain in the stomach previous to the use of vinegar, which is generally considered the best *antidote* to this poison. But the cold affusion on the head and body, he thinks, is superior to all other means.

636. Of the *morbid appearances*, but one good account has hitherto been given. The subject was a shepherd, who died comatose twelve hours after eating the berries. When the body was examined twelve hours after death, putrefaction had begun, so that the belly was swelled, the scrotum and penis distended with fetid serum, the skin covered with dark vesicles, and the brain soft. The blood-vessels of the head were gorged, and the blood every where fluid, and flowing profusely from the mouth nose, and eyes.

2. *Of Poisoning with Thorn-Apple.*

637. It is chiefly the fruit and seeds of the thorn-apple, or *Datura stramonium*, that have hitherto been examined; but the whole plant is probably poisonous. It contains a peculiar alkaloid, which has been named *daturia.*

638. The poison of thorn-apple, like that of the deadly-nightshade, acts through the blood-vessels, and probably on the brain.

639. The symptoms produced by a poisonous dose in man are variable. The leading features are great delirium, dilatation of the pupils, and stupor; but sometimes spasms, and occasionally palsy occur.

640. Dangerous effects may result from the application of the thorn-apple to the skin when deprived of the cuticle. An instance has been published of alarming narcotism from the application of the leaves to an extensive burn.

641. *Treatment of Poisoning with Thorn-Apple.* Blood-letting seems peculiarly called for in poisoning with the thorn-apple, on account of the strong signs of determination of blood to the head.*

642. As to the *morbid appearances*, considering the signs of strong determination of blood towards the head, which prevail during life, general congestion of the brain and sinuses may naturally be expected.

3. *Of Poisoning with Tobacco.*

643. Tobacco, the *Nicotiana tabacum* of botanists, is familiarly known to be, in certain circumstances, a virulent poison. Every part of the plant possesses active properties. It appears to contain an acrid, alkaline principle, and an essential oil to which the alkaloid adheres with great obstinacy.

644. The effects of tobacco are somewhat different from those of the belladonna and thorn-apple. *Orfila* remarked that 5½ drachms of common rappee introduced into the stomach of a dog, and secured by a ligature, caused nausea, giddiness, stupor, twitches in the muscles of the neck, and death in nine hours; and that two drachms and a quarter applied to a wound, proved fatal in a single hour. *Mr. Brodie*, however, has found that the effects are very different, according to the form in which

---

* The evacuation of the stomach and bowels must not, owever, be neglected.

the poison is used. Thus four ounces of a strong infusion, when injected into the anus of a dog, killed it in ten minutes, by paralyzing the heart; for after death the blood in the aortal cavities was arterial. But the empyreumatic oil does not act in that manner: it excites convulsions and coma, without affecting the heart. It may prove fatal in two minutes. Like other violent poisons, it has no effect when applied directly to the brain or nerves.

645. The effects observed in man are allied to those produced in dogs by the infusion. In a slight degree they are frequently witnessed in young men, while making their first efforts to acquire the absurd practice of smoking. The first symptoms are acceleration and strengthening of the pulse, with very transient excitement, then sudden giddiness, fainting and great sickness, accompanied with a weak, quivering pulse. These effects are for the most part transient and trifling, but not always. Some degree of somnolency is not uncommon.

646. Serious consequences have resulted from the application of tobacco to the abraded skin. An account has been given of three children who were seized with giddiness, vomiting, and fainting, from the application of tobacco leaves to the head for the cure of ring-worm.

647. The only well authenticated cases in recent times of death, from poisoning with tobacco, are those produced by the employment of too large

doses in the way of injection. Many accidents of this nature have occurred. One has been minutely related, which arose from an ounce or rather more, boiled for fifteen minutes in water, and administered by advice of a female quack. The individual, who labored merely under dyspepsia and obstinate costiveness, was seized in two minutes with vomiting, violent convulsions, and stertorous breathing, and died in three quarters of an hour. Another accident of the same kind is noticed, in which the person became, as it were, intoxicated, and died immediately. Instead of an infusion of two drachms, she had used a decoction of two ounces. Even two drachms, however, are by no means a safe dose.*

648. The following is a good account of the *morbid appearances* in a case of poisoning with tobacco. There was a great lividity of the back, paleness of the lips, flexibility of the joints, (two days after death,) diffuse redness of the omentum, without gorging of vessels, similar redness, with gorging of vessels, both on the outer and inner coats of the intestines, in some parts of the mucous coat patches of extravasation, unusual emptiness of the

---

* *Treatment of Poisoning with Tobacco.*—The first indication is to administer an astringent infusion, such as an infusion of nutgalls, which has the property of precipitating the alkaline principle contained in tobacco, in an uncombined and insoluble state. Stimulants must afterwards be resorted to, for the purpose of rousing the depressed powers of the system.

vessels of the abdomen; while the stomach was natural, the lungs pale, the heart empty in all its cavities, and the brain natural.*

SECT. III. *Of Poisoning with the Hemlock and Fool's Parsley.*

649. The natural order of the *Umbelliferæ*, contains many plants possessed of narcotico-acrid properties. The leading symptoms they produce, are delirium, convulsions, and coma; but several have also distinct irritating properties.

1. *Of Poisoning with Common Hemlock.*

650. The juice of the common hemlock, or *Conium maculatum*, contains a peculiar alkaloid named *conia*, the effects of which are very powerful, and somewhat resemble those of strychnia, a better known substance of the present class of

---

* Attention may be called in this place to the plants of the order *Lobeliaceæ*. They are all dangerous, in consequence of the excessive acidity of their milk. The *Lobelia inflata*, or Indian tobacco, is a very active article of our materia medica. The leaves and capsules of this plant when chewed, occasion giddiness, nausea and vomiting; when swallowed in considerable quantity, they produce obstinate and painful vomiting, delirium, convulsions, and death. The *L. syphilitia* has an acrid and persistent taste, resembling that of tobacco, and exciting nausea. *L. cardinalis* is used among our Indians as an anthelmentic. The *L. tupa* of Chili, yields a dangerous poison. And the *L. longiflora*, of the West India islands, is one of the most venomous of plants. The Spanish Americans, we are informed by Mr. Lindley, call it *Revente cavallos,* because it proves fatal to horses that eat it, swelling them until they burst.

poisons (701.) Half a grain of conia will kill a rabbit, and produces tetanus.

651. The effects of hemlock itself on the animal system, are sometimes purely soporific like those of opium; at other times they are like the effects of belladonna and thorn-apple. Its irritant action is not well established.

652. An ounce of the extract of the leaves killed a dog in forty-five minutes, when swallowed; ninety grains killed another through a wound, in an hour and a half, and twenty-eight grains another through a vein, in two minutes. It therefore acts by entering the blood. The symptoms produced were convulsions and insensibility; and in the dead body, the blood of the left cavities of the heart was sometimes found arterial.

653. A fatal case of poisoning with hemlock in the human subject has been described, which closely resembled poisoning with opium. The subject of it, a soldier, had partaken, along with several comrades, of a soup containing hemlock leaves, and appeared to them to drop asleep not long after, while they were conversing. In the course of an hour and a half, they became alarmed on being all taken ill with giddiness and headache: and the surgeon of the regiment was sent for. He found the soldier, who had fallen asleep, in a state of insensibility, from which, however, he could be roused for a few moments. His countenance was bloated, the pulse only thirty, and

the extremities cold. The insensibility rapidly became deeper and deeper, till he died, three hours after taking the soup. His companions recovered. Two other cases, which were fatal in the same short space of time, are also mentioned. Giddiness, coma, and convulsions, were the principal symptoms. The men who recovered were affected exactly as if they had taken opium.

654. When the dose is not sufficient to prove fatal, there is sometimes paralysis, attended with slight convulsions. More commonly there is frantic delirium.*

655. As to the *morbid appearances*, in the case mentioned (653) the vessels of the head were much congested; and the blood must have been very fluid, for on opening the head a quantity flowed out, which twice filled an ordinary chamber-pot. On account of this extreme fluidity of the blood, it often flows from the nose, and the skin is much marked with lividity.†

2. *Of Poisoning with Water-Hemlock.*

656. The water-hemlock, or *Cicuta virosa*, pos-

---

* *Treatment of poisoning with hemlock.*—Iodine, bromine and chlorine, are said to be antidotes to the vegetable alkaloids generally; but we are not aware of their action upon the alkaline principle contained in hemlock. The most prompt means of removing the poison from the stomach should, therefore, be resorted to; and the strongest direct emetics administered, if the stomach pump be not at hand.

† "It has been found that a small portion of the infusion of hemlock, prevents fresh-drawn blood from coagulating." C.

sesses even more energy as a poison, than the common hemlock; and in its effects it appears to resemble the hydrocyanic acid.

657. Poisoning with cicuta has been stated to commence with dimness of sight, giddiness, acute headache, anxiety, pain in the stomach, dryness in the throat, and vomiting. The cases of eight children who ate the roots instead of parsnips, have been described. Of those who were seriously affected, one, a girl six years old, who ultimately recovered, had tetanic fits, followed by deep coma, from which it was impossible to rouse her for twenty-four hours. Two of them died. The first symptoms of these two were swelling in the pit of the stomach, vomiting or efforts to vomit, then total insensibility, involuntary discharge of urine, and finally severe convulsions, during which the jaws were locked, the eyes rolled, and the head and spine were bent backwards, so that a child might have crept between the body and the bedclothes. One of them died half an hour after being taken ill, the other not long after.*

3. *Of Poisoning with Hemlock Dropwort.*

658. The dead-tongue or hemlock dropwort, the *Œnanthe crocata* of botanists, is even more active

---

* The American hemlock (*Cicuta maculata*) has been introduced into the practice of medicine in this country as a substitute for the *Conium maculatum*. Its effects are very analagous, but rather more powerful than those of the common hemlock.

than the cicuta. It has an abundant, milky, acrid juice. The plant is apt to be mistaken for hemlock by collectors of medicinal vegetables—a mistake of serious consequence; for even a single medicinal dose of the extract, taken instead of extract of hemlock, might prove fatal.

659. This plant seems to be the most energetic of the umbelliferous vegetables. In none of the fatal cases on record was life prolonged beyond three hours and a half, and in several death took place within an hour. One man was killed by a single spoonful of the juice of the root.

660. The usual symptoms of poisoning with the Œnanthe, appear to be heat in the throat and stomach, delirium, stupor, hardly ever proper coma, but generally convulsions, more or less violent. A case is mentioned in which the patient became furiously maniacal, but recovered his senses the next day. The particulars are given of the case of a boy, nine years old, who ate the roots by mistake for the ground-nut, and died in four hours, though part of the poison was expelled by emetics.

4. *Of Poisoning with Fool's Parsley.*

661. Another umbelliferous plant of great activity is the fool's parsley, or *Æthusa cynapium.* It has occasioned many accidents by reason of its resemblance to parsley,—from which, however, it is at once distinguished by the leaves being black and glistening on their lower surface, and by the nauseous smell they emit when rubbed. It con-

tains an alkaloid, which chrystallises in rhombic prisms, and is soluble in water and alcohol, but not in ether.

662. Among other cases of poisoning with fool's parsley, are related those of two ladies who ate a little of it in a sallad, having mistaken it for parsley, and who were soon seized with nausea, vomiting, headache, giddiness, somnolency, pungent heat in the mouth, throat, and stomach, difficulty in swallowing, and numbness of the limbs. The case of a child is also related who died in eight hours. The symptoms were spasmodic pain in the stomach, swelling of the belly, lividity of the skin, and difficulty of breathing.

SECT. IV. *Of Poisoning with Plants of the order Ranunculaceæ.*

663. The poisons of the natural order of *Ranunculaceæ,* are most of them only acrid in their action; (401;) but two of them possess distinctly the characters of the narcotico-acrids,—*monkshood* and black *hellebore.*

1. *Of Poisoning with Monkshood.*

664. The monkshood, or *Aconitum napellus,*[*] is an active poison, and a true narcotico-acrid. Every part of the plant is poisonous. A singular

---

[*] The whole of the genus anconitum is poisonous. The properties of the plant are supposed to reside in an alkaline principle which has received the name of aconita, or aconitia.

numbness and prickling of the lips has been felt from chewing the leaves and seeds.

665. Some of the cases of poisoning with monkshood, have exhibited symptoms of a decided narcotic action; while in others, death took place under the characteristic effects of the pure acrid poisons.

666. In a very dangerous, but not fatal case, the symptoms were first tingling in the jaws, extending subsequently over the whole body, and accompanied with a sensation as if of swelling of the face, then twitching of the muscles, fixing of the eyes, locked-jaw, and failure of the pulse and breathing, but without any aberration of mind.

667. A fatal case is mentioned of poisoning with monkshood, the chief symptom of which was maniacal delirium.

668. Several distinct examples are related of the irritant action of monkshood. Three out of five persons, who took a spirituous infusion of the root, which had been mistaken for lovage, died in two hours with vomiting, purging, and burning in the throat, colic, and swelling of the belly. The tincture of the fresh root, therefore, seems a very active preparation. In farther proof of the acrid properties of this plant, it may be added that the external application of the leaves will sometimes blister the skin, and the introduction of the juice into a wound in a limb, causes extensive inflammation of the surrounding parts.

669. The *appearances in the dead body* have been, great redness in the gullet, stomach, small

intestines, and rectum, the lungs dense, dark, and gorged, and the cerebral vessels turgid.

2. *Of Poisoning with Black Hellebore.*

670. The black hellebore, melampodium, christmas-rose, or *Helleborus niger*,* is also a true narcotic-acrid poison. Its active principle appears to be an oily matter containing an acid.

671. Two or three drachms of the root killed a dog in eighteen hours when swallowed; two drachms killed another in two hours, when applied to a wound; and six grains on a wound caused death in twenty-three hours. In all cases, the leading symptoms are efforts to vomit, giddiness, palsy of the hind legs, and insensibility. Ten grains of the extract introduced into the windpipe, killed a rabbit in six minutes.

672. Two characteristic cases in the human subject have been mentioned. Both persons, after taking a decoction of the root, were seized in forty-five minutes with vomiting, then with delirium, and afterwards with violent convulsions. One died in two hours and a half, the other in less than two hours. Another case has been related, which proved fatal in about sixteen hours, the leading symptoms of which were pain in the stomach, and vomiting. The dose in this instance was only half a drachm of the extract.

673. The *morbid appearances* in the last case, were signs of inflammation in the digestive canal,

---

* The *Helleborus viridis* and *H. fœtidus*, possess the same properties.

particularly in the great intestines. In the former cases there was gorging of the lungs, and the stomach had a brownish black color, as if gangrenous.

SECT. V. *Of Poisoning with Emetia.*

674. Emetia, the active principle of the *Cephaelis ipecacuanha,** is a powerful poison. Two grains of the pure alkaloid will kill a dog; and the

---

* The *Cephaelis ipecacuanha* belongs to the order chinchonaceæ of Lindley, the great features of which are its powerful febribuge or emetic properties. Several genera of plants belonging to this order yield the alkaloid emetia. And there are other North American plants belonging to different orders, which, in consequence of their possessing analogous properties, may be noticed under the same head. They are as follows:—

Among the Euphorbiaceæ, we have the ipecacuanha-spurge (*E. ipecacuanha,*) which, in large doses, according to Dr. Bigelow, excites active and long continued vomiting, attended with a sense of heat, vertigo, indistinct vision, and prostration of strength. The *E. corrollata* possesses similar properties.

The American ipecacuanha (*Gillenia trifoliata,*) more commonly called Indian physic, and the *G. stipulacœa*, are emetic and sudorific.

The American nightshade (*Phytolacca decandra,*) or poke-root, is hardly inferior, as an emetic, to ipecacuanha. The same may be said of the *Apocynum androsœmifolium*, or Dogbane, the root of which is intensely bitter and nauseous; and several other plants of the order Apocyneæ, used as substitutes for ipecacuanha.

Finally, the plants of the order Violaceæ, which yield an alkaloid principle, possessing nearly the same virtues as the real emetia.

symptoms are frequent vomiting, followed by sopor and coma, and death in fifteen or twenty-four hours.

675. In the *dead body* the lungs and stomach are found inflamed. The same effects result from the injection of it into a vein, or applying it to a wound. It appears then to be a narcotico-acrid; but its irritant properties are the most prominent.

SECT. VI. *Of Poisoning with Squill, White Hellebore, Meadow Saffron, and Foxglove.*

1. *Of Poisoning with Squill.*

676. The root of the squill, or *Scilla maritima*, possesses the properties of the narcotico-acrids. The experiments on animals assign to it an action only on the nervous system, but the effects caused on man, leave no doubt that it is also an active irritant. It contains an acrid principle, a grain of which will kill a dog.*

677. In the human subject, squill causes sickness, vomiting, diarrhœa, gripes, and bloody urine, when given in overdoses. It has likewise produced narcotic symptoms. An instance is mentioned of a woman, who died from taking a spoonful of the root in powder to cure tympanitis. She was immediately seized with violent pain in the stomach; and in a short time expired in convulsions.

---

* The supposed active principle of squill has received the name of scillitin.

678. The stomach was found every where inflamed, and in some parts eroded.

679. Twenty grains of the powder have proved fatal. And a quarter of an ounce of the syrup of squills, which is a common medicinal dose, has been known to cause severe vomiting, purging and pain.[*]

2. *Of Poisoning with White Hellebore.*

680. The white hellebore or *Veratrum album*,[†] another species of the same genus, the *V. Sabbadilla*, and the meadow-saffron or *Colchicum autumnale*, are characteristic examples of the narcotico-acrids. They all owe their properties to the same alkaloid, the *veratra*.

681. The veratra in small doses excites violent vomiting and purging; in larger doses, or when injected into a vein, though in minute quantity, it causes death by tetanus, without any local symptoms of irritation.[‡]

682. The root of the white hellebore is also very poisonous to animals of all classes. It acts in whatever way it is introduced into the system—by the stomach, rectum, windpipe, nostrils, pleu-

---

[*] The chief pharmaceutical preparations of squill, are:—Acetum scillæ (*vinegar of squill,*) Mel scillæ acetatum, Mel scillæ, and Syrupus scillæ, (*syrup of squills.*)

[†] The American hellebore (*V. viride*) possesses undoubtedly the same properties as the European species.

[‡] The antidotes to poisoning with veratra, are said to be iodine, bromine and chlorine (704.)

ral membrane of the chest, and external wound, or the veins.

683. It produces in every instance, symptoms of irritation in the alimentary canal, and injury of the nervous system. In the following cases, though not fatal, the symptoms that ensued were very characteristic of its double action. Three people took the root, by mistake, for Galanga root. In an hour, they had all burning in the throat, gullet and stomach, followed by nausea, dysuria, and vomiting; weakness and stiffness of the limbs; giddiness, blindness, and dilated pupil; great faintness, convulsive breathing, and small pulse. One of these, an elderly lady, who took the largest share, had an imperceptible pulse, stertorous breathing, and total insensibility even to ammonia held under the nose. Next day she continued lethargic, complained of headache, and had an eruption like flea-bites. A fatal case is quoted of a man who took twice as much as could be held on the point of a knife. He was attacked with violent and incessant vomiting, and lived only from morning to night.

684. The gullet, stomach and colon were here and there inflamed.

3. *Of Poisoning with the Meadow Saffron.*

685. The seeds and root of the meadow saffron are poisonous. The seeds are probably much more active than the root; and it is probable also that the power of the root varies considerably, accord-

ing to the season. The latter is usually considered most active in the spring; but it has been mentioned, as most energetic in the autumn.

686. Several cases of fatal poisoning with the meadow saffron have occurred in consequence of its too free use in the treatment of gout. A case is noticed of a man who took, by mistake, an ounce and a half of the tincture,* and died in forty-eight hours, after suffering much from vomiting, acute pain in the stomach, colic, purging and delirium. Cases have also been noticed of two children who were poisoned by a handful of the seeds, and who died in a day affected with violent vomiting and purging.

687. In the bodies of these children, there was was considerable redness of the stomach and small intestines; in the former cases there was no morbid appearance at all to be found.

4. *Of Poisoning with Foxglove.*

688. Foxglove, or *Digitalis purpurea*, possesses powerful and peculiar properties; and the affections induced by it are often much more lasting than the effects of most other vegetable narcotics. The leaves are considered its most active part.†—

---

* The officinal preparations of meadow saffron, which are most employed, are:—Acetum colchici; Oxymel colchici; Syrupus colchici; Vinum colchici radicis; Tinctura seminum colchici; Venum colchici seminis; and the *Eau Medicinale d'Husson*, so highly celebrated as a cure for gout.

† The Infusum digitalis and Tinctura digitalis are the principal officinal preparations.

They contain an alkaloid, which has been called *digitalia*.

689. From an extensive series of experiments on animals with the powder, extract and tincture of the leaves, foxglove appears to cause in moderate doses, vomiting, giddiness, languor and death in twenty-four hours, without any other symptom of note; but in larger doses, it likewise produces tremors, convulsions, stupor and coma. It acts energetically when applied to a wound, and when injected into a vein.

690. Upon man its effects as a poison have been frequently noticed, partly in consequence of its being given, by mistake, in too large a dose as a medicine, partly on account of the singular property it possesses, in common with mercury, of accumulating silently in the system, when given long, in moderate doses, and at length producing constitutional effects, even after it has been discontinued.

691. The following case exemplifies its effects in a single large dose. An old woman drank ten ounces of a decoction made from the handful of the leaves in a quart of water. She grew sick in the course of an hour, and for two days she had incessant retching and vomiting, with great faintness and cold sweats in the intervals, some salivation and swelling of the lips, and a pulse feeble, irregular, intermitting, and not above forty. She had also suppression of urine for three days.

692. A fatal case, which arose from an overdose,

is thus related. Six ounces of a strong decoction were taken as a laxative early in the morning.—Vomiting, colic and purging, were the first symptoms, towards the afternoon, lethargy supervened; about midnight, the colic and purging returned; afterwards, general convulsions made their appearance; and a surgeon who saw the patient at an early hour of the succeeding morning, found her violently convulsed, with the pupils dilated and insensible, and the pulse slow, feeble and irregular. Coma gradually succeeded, and death took place in twenty-two hours after the poison was swallowed.

693. The symptoms arising from its gradual accumulation are in the slighter cases, nausea, vomiting, giddiness, want of sleep, sense of heat throughout the body, and of pulsation in the head, general depression, sometimes diarrhœa, sometimes salivation, and for the most part profuse sweating. In more urgent cases, convulsions also occur; and it appears that the disorder thus induced, may prove fatal.*

694. As to the *morbid appearances*, in the case (692,) it is said that the external membranes of the

---

* *Treatment of Poisoning with Foxglove.*—An infusion of the *cinchona cordifolia*, or yellow bark, which precipitates an insoluble compound from an infusion or tincture of digitalis, may be considered as a good *antidote*. Further symptoms of poisoning must be counteracted, by administering cordials, ammonia, opium, and the application of a blister to the pit of the stomach.

brain were much injected with blood, and the inner coat of the stomach red in some parts.

Sect. VII. *Of Poisoning with Strychnia, Nux Vomica, St. Ignatius Bean, Upas Tieute, False Angustura, Woorara, Ticunas, and Curare.*

695. This section includes a few vegetable poisons that act in a very peculiar manner. They induce violent spasms, exactly like tetanus, and cause death during a fit, probably by suspending the respiration. In this respect they resemble hydrocyanic acid, and the water hemlock; but they differ from these and all similar poisons, in not impairing the sensibility. During the interval of the fits the sensibility is on the contrary heightened, and the faculties acute.

696. Death, however, does not always take place by tetanus. In some cases the departure of the convulsions has been followed by a fatal state of general and indescribable exhaustion.

697. Besides thus acting violently on the nervous system, they also possess local irritant properties; but these are seldom observed on account of the deadliness and quickness of their remote operation on the spine and nerves.

698. They exert their action by entering the blood vessels. The dose required to prove fatal is exceedingly small. The organ acted on is chiefly the spinal chord; but sometimes they seem also to act on the heart.

699. They seldom leave any morbid appear-

ances in the dead body. Like the other causes of death by obstructed respiration, such as drowning and strangling, they produce venous congestion; but this is frequently inconsiderable. Sometimes, however, they leave signs of inflammation in the alimentary canal.

700. There are only two genera included in the present group, the plants of the genus *strychnos*, and the *Brucea antidysenterica*. Nearly all the plants belonging to the former genus, contain an alkaloid; the *strychnia* to which their poisonous properties are owing.

1. *Of Poisoning with Strychnia.*

701. Except the hydrocyanic acid no poison is endowed with such destructive energy as the strychnia. It acts in whatever way it is introduced into the system, but most energetically when injected into a vein.

702. The first symptoms appear in sixty or ninety seconds when the poison is applied to a wound. When it is injected into the pleura they have been known to begin in forty-five seconds, and others have seen them begin in fifteen seconds. It has been asserted that this poison has no effect when directly applied to the nerves.

703. The symptoms produced are very uniform and striking. The animal becomes agitated and trembles, and is then seized with stiffness and starting of the limbs. These symptoms increase, till at length it is attacked with a fit of violent

general spasm, in which the head is bent back, the spine stiffened, the limbs extended and rigid, and the respiration checked by the fixing of the chest. The fit is then succeeded by an interval of calm, during which the senses are quite entire or unnaturally acute. But another paroxysm soon sets in, and then another and another, till at length a fit takes place more violent than any before it; and the animal perishes suffocated.

704. *Treatment of Poisoning with Strychnia.* The *antidotes* to poisoning with strychnia, as well as for the other vegetable alkaloids, are stated to be iodine, bromine, and chlorine. These are said to form with the alkaloids, compounds which are not deleterious; two grains and a half of the iodide, bromide, and chloride of strychnia, having produced no effect on a dog. Animals which had taken one grain of strychnia, or two grains of veratra, did not sustain any harm, when tincture of iodine was administered immediately afterwards. But the delay of ten minutes in the administration of the antidote rendered it useless.

2. *Of Poisoning with Nux Vomica.*

705. On account of the singular symptoms of irritation of the spinal chord, uncombined with any injury of the brain, nux vomica is supposed to act on the spinal marrow alone; but from some experiments, it appears also to exhaust the irritability of the heart; for in animals, it was found that organ could not be stimulated to contract after

death, and life could not be prolonged by artificial breathing.

706. The most characteristic example yet published of poisoning with nux vomica, in the human subject, is a case related of a young woman, who, in a fit of melancholy, took between two and three drachms of the powder in water. When the surgeon first saw her, half an hour afterwards, she was quite well. But going away in search of an emetic, and returning in ten minutes, he found her in a state of great alarm, with the limbs extended and separated, and the pulse faint and quick. She then had a slight and transient convulsion, succeeded by much agitation and anxiety. In a few minutes she had another, and not long afterwards a third, each about two minutes in duration. During the fits, the whole body was stiffened and straightened, the legs pushed out, and forced wide apart; no pulse or breathing could be perceived; the face and hands were livid, and the muscles of the former violently convulsed. In the short intervals between the fits she was quite sensible, had a quick faint pulse; complained of sickness with great thirst, and perspired freely. A fourth and most violent fit soon succeeded, in which the whole body was extended to the utmost, from head to foot. From this she never recovered. She seemed to fall into a state of asphyxia, relaxed her grasp, and dropped her hands on her knees. Her brows, however, remained contracted, her lips drawn apart, salivary foam issued from the corners of the

mouth, and the expression of the countenance was altogether most horrific. She died an hour after swallowing the poison.

707. When death does not take place thus suddenly in a fit of spasm, the person continues to be affected for twelve or sixteen hours with similar, but milder paroxysms; and afterwards he may either recover without further symptoms, or expire in a short time apparently from exhaustion, or suffer an attack of inflammation of the stomach and intestines, which may or may not prove fatal.

708. The following case exemplifies very well the effects of the poison when the dose is not sufficient to cause death; it also shows its double narcotico-acrid properties.—A young woman swallowed, purposely, a drachm mixed in a glass of wine. In fifteen minutes she was seized with pain and heat in the stomach, burning in the gullet, a sense of rending and weariness in the limbs, succeeded by stiffness of the joints, convulsive tremors, tottering in her gait, and, at length, violent and frequent fits of tetanus. Milk given after the tetanus began, excited vomiting. She was farther affected with redness of the gums, inflammation of the tongue, burning thirst, and pain in the stomach. The pulse also became quick, and the skin hot. Next day, though the fits had ceased, the muscles were very sore, especially on motion. The tongue and pallet were inflamed, and there was thirst, pain in the stomach, vomiting, colic and diarrhœa. These symptoms, how-

ever, abated, and disappeared on the fourth day, leaving her exceedingly weak.

709. With regard to the dose required to prove fatal, the ſmallest ſatal dose of the alcoholic extract yet recorded, is three grains; a fatal case is mentioned, caused by two fifteen grain doses of the powder; and another caused by two drachms, which was fatal in two hours. A dog has been killed by eight grains of the powder, and a cat by five. It is even said that a dog has been killed by two grains.

710. *Treatment of Poisoning with Nux Vomica.*—Little is known of the treatment of this kind of poisoning. But it is of the greatest moment to evacuate the stomach thoroughly, and without loss of time. Hence emetics are useful; but if the stomach pump is at hand, it ought to be resorted to without waiting for the operation of emetics. When nux vomica is taken in powder, which is the most frequent form in which it has been used, it adheres with great obstinacy to the inside of the stomach. Consequently, whatever means are employed for evacuating the stomach, they must be continued assiduously for a considerable time. If the patient is not attacked with spasms in two hours, he will generally be safe.—It remains to be proved that the same advantages will be derived from the administration of iodine, bromine and chlorine as antidotes in the instance of poisoning with nux vomica, as in poisoning with its alkaloid. (704.)

711. The *morbid appearances* differ according to the period at which death takes place. In a case where death took place in an hour, the appearances were insignificant. The stomach was almost natural, the vessels of the brain somewhat congested, the heart flaccid, empty and pale. In another case there was general inflammation of the stomach, duodenum, and part of the jejunum.—In a slower case there was very little appearance of inflammation. In an interesting dissection of a case which was quickly fatal, there was found much serous effusion on the surface of the cerebellum, and softening of the whole cortical substance of the brain, but especially of the cerebellum; this is some confirmation of an opinion advanced not long ago in France by *Flourens* and others, that nux vomica acts particularly on the cerebellum.

3. *Of Poisoning with St. Ignatius Bean and Upas Tieute.*

712. The *Strychnos Sancti Ignatii*, or the St. Ignatius bean, contains about three times as much Strychnia as the nux vomica. It is very energetic. An instance is mentioned of a man, who was attacked with tetanus of several hours duration after taking the powder of half a bean in brandy, and who seems to have made a narrow escape.

713. The *Strychnos tieute* is the plant which yields the Upas tieute, one of the Javanese poisons. It contains Strychnia and appears to be al-

most as energetic as this alkaloid itself. The bark of the plant which yields it, when applied in the dose of fifty grains to a wound, killed a rabbit in two hours and a half.

4. *Of Poisoning with false Angustura bark.*

714. The false Angustura bark, the *Brucea antidysenterica*,* causes symptoms of the same kind as the poisons of the genus Strychnos, and owes its power to an analogous principle, the *Brucia.*

715. The alkaloid is said to be twenty-four times less powerful than Strychnia; but the bark itself is as strong nearly as nux vomica, for eight grains were found to kill a dog in less than two hours.†

716. Some very interesting experiments were made with this poison to show that it acts on the spine directly, and not on the organ through the medium of the brain. If an animal be poisoned by inserting the extract of false Angustura bark into the hind legs after the spinal chord has been severed at the loins, the hind legs as well as the fore legs are thrown into a state of spasm; or if the medulla oblongata be cut across and respira-

---

* The false Angustura bark, which has sometimes been introduced into Europe mixed with the true Angustura, is obtained from S. America, and belongs probably to a species of Strychnos, and not to the *Brucea Antidysenterica*, the latter being an African plant.

† The Salts of Brucia, namely the sulphate and muriate, are very soluble in water, and consequently more active than the base itself.

tion be maintained artificially, the usual symptoms are produced over the whole body by the administration of it internally or externally,—the only material difference being that they commence more slowly, and that a larger dose is required to produce them, than when the medulla is not injured. On the other hand, when the spinal chord is suddenly destroyed after the symptoms have begun, they cease instantaneously, although the circulation goes on for some minutes.

717. The symptoms it induces in man are almost the same as those caused by nux vomica. It appears, moreover, that during the interval of the fits, the sensibility is remarkably acute. A boy who fell a victim to it implored his physician not to touch him, as he was immediately thrown into a fit. *Professor Marc* of Paris, was once violently affected by this poison, which he took by mistake for the true Angustura, to cure ague. He took it in the form of an infusion, and the dose was only three quarters of a liquor-glassfull; yet he was seized with nausea, pain in the stomach, a sense of fulness in the head, giddiness, ringing in the ears, and obscurity of vision, followed by stiffness of the limbs, great pain on every attempt at motion, locked-jaw, and impossibility of articulating. These symptoms continued two hours; *and abated under the use of ether and laudanum.*

5. *Of Poisoning with Woorara,[*] Ticunas,[†] and Curare[‡].*

718. These poisons have been said to act on the spine only, and not on the brain also.

719. They do not produce convulsions or spasm of the muscles, but on the contrary, sudden paralysis, and probably occasion death in this way by suspending the respiration.[§]

---

[*] *Wourali*, improperly Woorara, is prepared by the Macoushi Indians with the wourali vine, and several other plants, the strongest Indian pepper, two species of ants, and the fangs of two species of snakes. These are made by a tedious process into a thick syrup of a deep brown colour, and kept very dry in a calabash covered with deer-skin. It is poisonous almost instantaneously: no antidote has been hitherto discovered.—*Rennie's Supplement, &c.*

[†] *Ticunas* is a less active poison than the Wourali. It is likewise a compound poison, which is prepared by the Indians of the valley of the Amazon. The *antidote* to this poison is said to be sugar.

[‡] *Curare* is prepared by the Indians in the valley of the Oronooco. There are several kinds of this poison. According to Humboldt, the genuine Curare is obtained from the bark of a plant called *verjuco di mavacure.* Orfila says that this poison acts solely upon the blood, which it appears to coagulate. The Abbe Gilij states, that the Spaniards of the Oronooco use common salt and urine, as an antidote to it.

[§] *Poison oak* (Rhus toxicodendron) acts upon the economy like the narcotico-acrid poisons. This plant belongs to the order Anacardiaceæ, or Cashew tribe, of Lindley, the distinctive properties of which are, that they abound in a resinous, sometimes acrid, highly poisonous, juice. There are several species of Rhus that are poisonous, the following account of which is borrowed from the New U. S. Dispensatory.

SECT. VIII. *Of Poisoning with Camphor, Cocculus Indicus, Upas Antiar, and Coriaria Myrtifolia.*

720. The present group of the narcotico-acrids, resemble strychnia in their action so far, that they produce, in large doses, convulsions of the tetanic

"*Rhus radicans*, usually called *poison vine*, has a climbing stem, rising to a great height upon trees, rocks, and other objects, to which it adheres by strong rooting fibres, which it throws out from its sides. The leaves, which stand upon long footstalks, are ternate, with broad ovate or rhomboidal, acute leaflets, smooth and shining on both sides, sometimes slightly hairy on the veins beneath, entire, or irregularly lobed and toothed. The flowers are small, greenish white, diœcious, and grow in lateral, usually axillary panicles, or compound racemes. The male flowers have five stamens, and the rudiments of style; the female, which are only half the size, and on a different plant, have abortive stamens, and a short erect style, standing on a roundish germ, and terminating in three stigmas. The fruit consists of roundish, pale green, or whitish berries.

"*R. Toxicodendron*, or poison oak, has the form of a shrub from one to three feet high, with leaflets angularly indented, and pubescent beneath. But this character of the foliage is probably not constant; and the stunted growth may be owing to peculiarities of situation. Dr. Bigelow says, that the young plants of the *R. radicans*, do not put forth rooting fibres until they are several years old, and that they are influenced in this respect by the contiguity of supporting objects. The R. toxicodendron grows in woods, fields, and along fences from Canada to Georgia. It flowers in June and July. When wounded, it emits a milky juice, which becomes black on exposure to the air. Ether dissolves it. The juice applied to the skin, frequently produces inflammation and vesication; and the same kind. But they differ considerably by producing at the same time, impaired sensibility or sopor.

1. *Of Poisoning with Camphor.*

721. The symptoms caused by camphor in man, have not been often observed; but so far as they

poisonous property is possessed by a volatile principle ([a]) which escapes from the plant itself, and produces in persons who come into its vicinity, an exceedingly troublesome erysipelatous affection, particularly of the face. Itching, redness, a sense of burning, tumefaction, vesication, and ultimate desquamation, are some of the attendants of this poisonous action. The swelling of the face is sometimes so great as almost entirely to obliterate the features. The effects are experienced soon after exposure, and usually begin to decline within a week. *A light cooling regimen, with saline purgatives, and the local use of cold lead-water, are the best remedies.* All persons are not equally liable to the affection, and the great majority are wholly unsusceptible of it from any ordinary exposure. ([b])

"*R. Vernix*, or swamp sumach, is a beautiful shrub or small tree, usually ten or fifteen feet high, but sometimes rising thirty feet. The bark of the trunk is dark gray, of the branches lighter, of the extreme twigs and petioles beautifully red. The leaves are pinnate, with four or five pairs of opposite leaflets, and an odd terminal one. These are oblong or oval, entire or slightly sinuated, acuminate, smooth, and except that have been witnessed, they establish its claim to be considered a narcotico-acrid poison.

---

[a] Mr. Van Mons, of Brussels, has asserted, that the poisonous exhalation of the Rhus is a carburetted hydrogen gas.

[b] The compiler of this Manual followed on one occasion, the example set to him by Dr. De Villers, of Paris, of inoculating himself on the arm with the juice of R. radicans, and with no other effect than a slight pustular inflammation, confined to the spot intentionally poisoned.

722. Its narcotic effects are well exemplified in an account given by *Mr. Alexander*, from personal

at the end, nearly sessile. The flowers, as in the preceding species, are diœcious. They are very small, greenish, and arranged in loose axillary panicles. The berries are small, roundish, and greenish white.—The tree grows in swamps and low grounds, from Canada to Carolina, and flowers in June and July.—The R. Vernix produces much more powerfully than the *R. radicans* the poisonous effects already described. Persons coming within its influence are much more apt to be affected with the poison, and generally suffer more severely. The whole body is sometimes enormously swollen, and the patient for many days scarcely able to move; but the complaint almost always spontaneously subsides without destroying life. As in the former instance, the susceptibility to the influence of the poison is exceedingly various, and some persons may handle the plant with perfect impunity.

"*R. pumilum* is a southern species, growing in Upper Carolina, and not more than a foot in height. It is characterised by its pubescent branches and petioles; its pinnate leaves, with many pairs of oval, nearly acuminate, incised dentate leaflets, downy beneath; and by its silky fruit. According to Pursh, it is the most poisonous of the genus."

The *Cashew nuts*, the fruits of the *Anacardium occidentale*, the type of the order to which the Rhus belong, are frequently brought to this country from the W. Indies. We remember an accident produced by roasting these nuts, which took place among a class of students at St. Mary's college, Baltimore. The fumes which were disengaged in the room affected several of the youths present, who were the next morning on rising from bed found attacked with swelling of the face and eyes, in some instances to an alarming extent. A few of us present were not affected in any degree.

experience. After having found by a previous experiment, that a scruple did not cause any particular symptom, he swallowed in one dose two scruples mixed with syrup of roses. In the course of twenty minutes he became languid and listless, and in an hour giddy, confused, and forgetful. All objects quivered before his eyes, and a tumult of undigested ideas floated through his mind. At length he lost all consciousness, during which he was attacked with strong convulsive fits, and maniacal frenzy. These alarming symptoms were dispelled, on Dr. Monro, who had been sent for, accidentally discovering the subject of his patient's experimental researches, *and administering an emetic.* But a variety of singular mental affections continued for some time after. *The emetic brought away almost the whole camphor which had been swallowed three hours before.*

723. The following case proves the irritant action of camphor, and likewise the uncertainty of the dose required to act deleteriously. In the case of Mr. Alexander, (722,) two scruples would in all probability have proved fatal, had they not been discharged in time by vomiting. In the case now to be noticed, 160 grains were taken in a state of solution in alcohol, and were not vomited; yet the individual recovered. He was a drunkard, who took four ounces of camphorated spirit prescribed for him as an embrocation. Soon afterwards he was attacked with fever, burning heat of the skin, anxiety, burning pain in the stomach, giddiness,

flushed face, dimness of sight, sparks before the eyes, and some delirium. *He soon got well under the use of almond oil and vinegar, but did not vomit.*

2. *Of Poisoning with the Cocculus Indicus.*

724. *Cocculus Indicus* is the name given in the shops to the fruit of the *Menispermum cocculus.* It contains a peculiar alkaloid termed *picrotoxa,* ten grains of which have been found to kill a dog in twenty-five minutes in the second paroxysm of tetanus. The seeds themselves occasion vomiting soon after they are swallowed; so that animals may often swallow them, if not without injury, at all events without danger.

725. It has been inferred from experiments, that cocculus indicus acts by exhausting the irritability of the heart. It does not seem to possess distinct acrid properties in regard to animals.

726. Although it is well known that malt liquors have often been adulterated with cocculus indicus for the purpose of economizing hops, cases of poisoning in the human subject are rare, because the quantity required to communicate the due degree of bitterness is small. A set of cases have been shortly noticed which arose in consequence of an idiot having seasoned soup with it by mistake.—Nine people were taken ill with sickness, vomiting, pain in the stomach and bowels, and one died in twelve days.

3. *Of Poisoning with Upas Antiar.*

727. Upas antiar, or Japanese poison, appears to act in the same manner, and to produce the same effects as camphor and cocculus indicus. In small doses it acts as an irritant, in large doses it causes convulsions and coma.

728. If the body of an animal be examined immediately after death, from the Upas antiar, the heart is found to have lost its irritability, and the left ventricle to contain florid blood: like many other active poisons, it has no effect when applied to the divided end of a nerve.

4. *Of Poisoning with the Coriaria Myrtifolia.*

729. The toxicological effects of the *Coriaria myrtifolia*, have been recently investigated by *Professor Meyer*, of Bonn, who found that it excites in most animals, violent fits of tetanus, giving place to apoplectic coma; and that in the dead body, the brain is seen gorged with blood, the blood in the heart and great vessels fluid, the heart not irritable immediately after death, and the inner membrane of the stomach yellowish and shrivelled. A grain of the extract of the juice injected into the jugular vein of a rabbit, occasioned in about five hours a single convulsive paroxysm, which proved immediately fatal.*

---

* The berries of the *C. myrtifolia* are very poisonous, and Loudon informs us, that on one occasion, during the Spanish

SECT. IX.—*Of Poisoning with Mushrooms and Mosses.*

1. *Distinctive Characters of the Poisonous Fungi.**

730. It appears that most fungi which have a warty cap, more especially fragments of membrane adhering to their upper surface, are poisonous.

731. Heavy fungi, which have an unpleasant odor, especially if they emerge from a *vulva* or bag, are also generally hurtful.

732. Of those which grow in woods and shady places, a few are esculent, but most are unwholesome; and if they are moist on the surface, they should be avoided.

733. All those which grow in tufts or clusters from the trunks or stumps of trees ought likewise to be shunned.

734. A sure test of a poisonous fungus is an as-

---

war, fifteen French soldiers were taken ill after having eaten them, three of whom died from their powerful narcotic effects. The leaves of the plant are astringent and are used for dying black. These leaves have occasionally been detected in the parcels of Alexandria Senna imported into the United States.

* The essential botanical characters of the Fungi, or mushroom tribe, are:—"Plants consisting of a congeries of cellules, among which filaments are occasionally intermixed, increasing in size by addition to their inside, their outside undergoing no change after its first formation; chiefly growing upon decayed substances, frequently ephemeral, and variously colored. *Sporules* lying either loose among the tissue, or enclosed in membranous cases, called sporidia."—LIND.

tringent, styptic taste, and perhaps, also a disagreeable, but certainly a pungent odor. Some fungi possessing these properties, have indeed found their way to the epicure's table; but they are of a very questionable quality.

735. Those whose substance becomes blue soon after being cut are invariably poisonous.

736. Agarics of orange or rose-red color, and boleti which are coriaceous or corky in texture, or which have a membranous collar round the stem, are also unsafe; but these rules are not universally applicable in other genera.*

2. *Of the circumstances which modify the qualities of Esculent Fungi.*

737. The qualities of the fungi as articles of food are liable to considerable variety. Some which are eaten with safety, occasionally become hurtful; and some of the poisonous kind may under certain circumstances become inert, or even esculent. But the causes which regulate these variations are not well ascertained.

738. It has been thought by some that most fun-

---

*Dr. Christison judiciously remarks, "that these rules for knowing deleterious fungi seem to rest on fact and experience; but they will not enable the collector to recognise every poisonous species." It has been elsewhere advised to distrust all fungi except the cultivated ones. And it is further stated, that so strongly did the late Professor L. C. Richard, feel the prudence of this, he would never eat any except such as had been raised in mushroom-beds, although no one was better acquainted with their distinctive characters than he.

gi become safe when they have been dried; and there may be some truth in this remark, as their poisonous qualities appear to depend in part on a volatile principle, (743.) But it is by no means universally true.

739. Climate certainly alters their properties.—And there is some reason to believe, also, that the weather or period of the season, influences some of the esculent species. The common mushroom, *Agaricus campestris*,* is generally believed to become somewhat unsafe towards the close of the season. Its external characters at that time are sensibly altered, the margin of the cap is more acute, its white color less lively, and the rosy hue of its lamellæ tends towards brown.

740. Cooking produces some difference on their effects. The very best of them are indigestible

---

* The distinctive characters of the common mushroom, are: "cap white, fleshy, dry, sub-quamoze or sericeous; lamellæ free, ventricose, pink changing to dark fucous; stipes solid, white, with an annular veil." This is the only one of all the species of agarics which has been selected for cultivation in gardens. In Europe, there are four varieties of it cultivated. We are not aware, that it is any where the custom in the United States to raise them; but the species in two or three of its varieties, perhaps, is brought in great abundance to our markets, particularly in the fall. Some French residents of the city of Baltimore, collect a variety of the *Boletus edulis*, called by them, *cepe*, which they eat without any apprehensions. Its distinctive characters, are: "cap convex, smooth, cinereous yellow or brown: tubes nearly free, roundish, minute, whitish, at length yellowish, stipes thick, reticulated: flesh white, not changing color."

when raw; and some of the poisonous species may lose in part their deleterious properties when cooked, because heat expels the volatile principle; but, on the whole, the effect of cooking has not been satisfactorily shown to be considerable.* Some cryptogamous botanists have even on the contrary maintained that the qualities of the esculent mushrooms are injured by cooking, and that when used in the raw state, they may be taken for a long time as a principal article of food, without injury.

741. On certain persons, all mushrooms, even the very best of the eatable kinds, act more or less injuriously. They cause vomiting, diarrhœa, and colic. In this respect they are on the same footing with the richer sorts of fish, which by idiosyncracy act as poisons on peculiar constitutions.

742. Lastly, contrary to what some botanists have alleged, the best mushrooms, when taken in large quantity, and for a considerable length of time, are deleterious to every one, (753.)

3. *Of the Poisonous Principle of the Fungi.*

743. It has been stated, that in some fungi one, in others two poisonous principles, have been found. One of them is an acrid matter, so very fugacious, that it disappears when the plant is

---

* It has been asserted that the most poisonous mushrooms lose their injurious properties if allowed to soak a long time in vinegar, strong brine, or ether; and that the active principle thus dissolved is imparted wholly to the solvents.

either dried, or boiled, or macerated in weak acid, alkalis, or alcohol. To this principle the irritant properties of some fungi are thought to be owing.

744. The other principle is more fixed, as it resists drying, boiling, and the action of weak alkalis and acids. It is soluble in water, has neither smell nor taste, and forms crystallisable salts with acids. To this principle is attributed the narcotic properties of some fungi. It was found in the *Amanita bullosa*, *muscaria*, and *verna*, wherefore, it has been called *amanitine*.

745. The effects of the amanitine on animals appear to resemble considerably those of opium.

4. *Of the Symptoms produced in Man by the Poisonous Fungi.*

746. The symptoms produced by the fungi in man are endless in variety, and fully substantiate the propriety of arranging them in the class of narcotico-acrid poisons. Sometimes they produce narcotic symptoms alone, (747,) sometimes only symptoms of irritation, (748,) but much more commonly both together, (750.) It is likewise not improbable, that fungi, even though not belonging to the varieties commonly acknowledged as poisonous, induce, when taken for a considerable length of time, a peculiar depraved state of the constitution, leading to external suppuration and gangrene, (753.)

747. The following is a good instance of pure narcotism. A man gathered in Hyde Park a considerable number of the *Agaricus campanulatus*,

which he mistook for the *A. campestris*, stewed them, and proceeded to eat them; but before he had concluded his repast, and not above ten minutes after he began it, he was suddenly attacked with dimness of vision, giddiness, debility, trembling, and loss of recollection. In a short time he recovered so far as to be able to go in search of assistance. But he had hardly walked two hundred and fifty yards when his memory again failed him, and he lost his way. His countenance expressed anxiety, he reeled about, and could hardly articulate. The pulse was slow and feeble. He soon became so drowsy, that he could be kept awake only by constant dragging. *Vomiting was then produced by means of the sulphate of zinc; the drowsiness gradually went off; and next day he complained merely of languor and weakness.*

748. In the next set of cases the symptoms were those of almost pure irritation. Several French soldiers in Russia, ate a large quantity of the *Amanita muscaria*,* which they had mistaken for the

---

* Dr. Langsdorff informs us that the A. muscaria is used by the inhabitants of the north-eastern part of Asia in the same manner as wine, brandy, arrack, opium, &c. is by other nations. So very exciting to the nervous system, in many individuals, is the fungus, that the effects are often very ludicrous. If a person under its influence wishes to step over a straw or small stick, he takes a stride or a jump sufficient to clear the trunk of a tree; a talkative person cannot keep silence or secrets; and one fond of music is perpetually singing. The most singular effect of the amanita is the influence it possesses over the urine. It is said that from time imme-

A. cæsarea. Some were not taken ill for six hours or upwards. Four of them, who were very powerful men, thought themselves safe, because while their companions were already suffering, they themselves felt perfectly well; and they refused to take emetics. In the evening, however, they began to complain of anxiety, a sense of suffocation, frequent fainting, burning thirst, and violent gripes. The pulse became small and irregular, and the body bedewed with cold sweat; they trembled much; the lineaments of the countenance were singularly changed, the nose and lips acquiring a violet tint; the belly swelled, and a profuse fetid diarrhœa supervened. The extremities soon became livid and cold, and the pain of the abdomen intense; delirium ensued, and all the four died.

morial, the inhabitants have known that the fungus imparts an intoxicating quality to that secretion, which continues for a considerable time after taking it. For instance, a man moderately intoxicated to-day, will, by the next morning, have slept himself sober, but, (as is the custom,) by taking a teacup of his urine, he will be more powerfully intoxicated than he was the preceding day. It is therefore not uncommon for confirmed drunkards to preserve their urine as a precious liquor against a scarcity of the fungus. This intoxicating property of the urine is capable of being propagated; for every one who partakes of it has his urine similarly affected. Thus with a very few amanita, a party of drunkards may keep up their debauch for a week. Dr. Langsdorff mentions, that by means of the second person taking the urine of the first, the third that of the second, and so on, the intoxication may be propagated through five individuals.—*Torrey's Lindley, p.* 332.

749. The following set of cases shows the tendency of the poisonous fungi, to cause in one person pure irritation, and in another pure narcotism. A man, his wife, and three children, ate at dinner, carp which had been stewed by mistake with the *Amanita citrina.* The wife, the servant, and one of the children had vomiting, followed by deep sopor; but they recovered. The husband had true and violent cholera, but recovered also. The two other children became profoundly lethargic and comatose, emetics had no effect, and death soon ensued without any other remarkable symptom. The individuals who recovered, were not completely well till three weeks after the fatal repast.

750. The cases now to be mentioned, illustrate clearly the simultaneous occurrence of narcotic and irritant symptoms in the same individuals. They were produced by the *Hypophyllum sanguineum*, a small conical fungus of a mouse colour, that grows on a slender stem, and is well known to children in Scotland by the name of *puddock-stool.* This species seems to cause convulsions as well as sopor. A family of six persons, four of whom were children, ate about two pounds of it dressed with butter. The incipient symptoms, were pain in the pit of the stomach, a sense of impending suffocation, and violent efforts to vomit; which symptoms did not commence in any of them till about twelve hours after the poisonous meal, in one not till twenty hours, and in another not till

nearly thirty hours. One of the children, seven years of age, had acute pain of the belly, which soon swelled enormously; afterwards he fell into a state of lethargic sleep, but continued to cry; about twenty-four hours after eating the fungi, the limbs became affected with permanent spasms and convulsive fits; and in no long time he expired in a tetanic paroxysm. Another of the children, ten years old, perished nearly in the same manner, but with convulsions of greater violence. The mother had frequent bloody stools and vomiting; the skin became yellow; the muscles of the abdomen were contracted spasmodically, so that the navel was drawn towards the spine; profound lethargy and general coldness supervened; and she too died about thirty-six hours after eating the fungus. A third child, after slight symptoms of amendment had shown themselves, became worse, and died on the third day with trembling, delirium, and convulsions. This patient who had taken very little of the poison, was not attacked till about thirty hours after the meal. The fourth child, after precursory symptoms like those of the rest, became delirious, and had an attack of colic and inflammation of the bowels, without diarrhœa; but he eventually recovered. The father had a severe attack of dysentery for three days, and remained five days speechless. For a long time afterwards, he had occasional bloody diarrhœa. He eventually recovered; but even for an entire year his health continued to suffer.

751. A striking circumstance in respect to the symptoms of poisoning with the fungi, is the great difference in the interval which elapses between the time of eating, and that of their commencement. In the first case (747) the symptoms appear to have commenced in a few minutes; but, on the contrary, an interval of twelve hours is common; and a set of cases, seventeen in number, have been quoted, in which, as in one of those related, (750,) the interval is said to have been a day and a half. The tardiness of the approach of the symptoms is owing to the indigestibility of most of the fungi. Their indigestibility is in fact so great, that portions of them have been discharged by vomiting, so late as fifty-two hours after they were swallowed.

752. Another circumstance worthy of particular notice, is the great durability of the symptoms. Even the purely narcotic effects of some fungi have been known to last above two days. In the instance just alluded to, (751,) the vomiting of the poison was the first thing that interrupted a state of deep lethargy which had prevailed for fifty-two hours. The symptoms of irritation, after their violence has been mitigated, may continue for about three weeks, (749.)

753. The following cases support the opinion, that even the best mushrooms, when taken as a principal article of food for a considerable length of time, will prove injurious. A family, consisting of the mother and four children, were seized with a kind of tertian fever, and an eruption, on various parts of the body, of abscesses which dis-

charged a thin, ill-conditioned pus, passed rapidly into spreading gangrene, and proved fatal to the mother and one of the children. No other cause could be discovered to account for so extraordinary a conjunction of symptoms in so many individuals, except that for two months they had lived almost entirely on mushrooms; and the probability of this being really the case, was strengthened by the fact, that the father who slept always with his family, and who alone escaped, lived on ordinary food at a place where he worked not far off.

5. *Of the Treatment of Poisoning with Mushrooms.*

754. The treatment of poisoning with the fungi does not call for any special observations. *Emetics are of primary importance;* and after the poison has been by their means dislodged, the sopor and inflammation of the bowels are to be treated in the usual way. No antidote is known. Several have at different times been a good deal confided in; but none are of any material service.*

---

* Orfila says that *purgatives* are frequently preferable to emetics; because the action of mushrooms is generally very slow, and manifests itself only after they have reached the intestinal canal. It follows also from what has been previously stated—namely, *vinegar, salt and water,* and *ether,* having the property of extracting the active principle of poisonous mushrooms, that these liquids should *not* be administered. But when the mushrooms are evacuated, a few spoonfuls of some preparation containing ether, will be of service. Oil is a good condiment for esculent mushrooms, but is not an *antidote,* as some believe, to the poisonous ones.

6. *Of the Morbid Appearances caused by poisoning with deleterious Fungi.*

755. The body is in general very livid; and the blood fluid; so much so sometimes, that it flows from the natural openings in the dead body. In general the abdomen is distended with fetid air; which indeed is usually present during life. The stomach and small intestines of the four French soldiers, (748,) presented the appearance of inflammation, passing in some places to gangrene. In two of them especially, the stomach was gangrenous in many places and far advanced in putrefaction. The same appearances were found in the cases (750.) In these there was also an excessive enlargement of the liver. The lungs have sometimes been found gorged or even inflamed. The vessels of the brain are also sometimes very turgid. They were particularly so in a case where death was occasioned in seven hours by an infusion of the *Amanita muscaria* in milk. The whole sinuses of the dura mater, as well as the arteries, were enormously distended with blood; the arachnoid and pia mater were of a scarlet color; the vessels of the membrane between the convolutions, together with the plexus choroides, were also excessively gorged; and the substance of the brain was red. Lastly, a clot of blood as big as a bean, was found in the cerebellum.

756. The stomach, unless there has been vomiting or diarrhœa, will usually contain fragments of

the poison, if it has not been taken in a state of minute division; and this evidence of the cause of death may be obtained, even although the individual survived two days or upwards. Sometimes the fragments will be found in the intestines. In a patient who lived twenty-four hours, they were found in the neighborhood of ileo-cæcal valve, which was much inflamed.

7. *Of Poisoning with Mosses.*

757. It is not improbable that some of the mossess possess poisonous properties somewhat similar to those of the deleterious fungi. The *Lycopodium selago* is used in the Tyrol in the way of infusion for killing vermin in animals; and it is stated that unpleasant accidents have been produced in man by its accidental use. Its effects appear to be sometimes irritant, but more generally narcotic in their nature.

SECT. X.—*Of Poisoning with Diseased and Adulterated Grain.*

758. The different sorts of grain are subject to certain diseases, in consequence of which, meal or flour made with them are apt to be impregnated with substances more or less injurious to animal life. Grain is also rendered more or less injurious by the accidental or intentional admixture of a variety of foreign substances.*

---

* The poisons comprehended under this head, are: spurred rye, spurred maize, and darnel grass.

1. *Of Poisoning with Spurred Rye.*

759. *Spurred rye*, or *Secale cornutum*, the *Seigle ergoté*, or *ergot* of the French, and *mutterkorn*, or *roggen-mutter* of the Germans, is a disease common to various grains, in consequence of which the place of the pickle is supplied by a long black substance, like a little horn or spur. It has been known to attack many plants of the order gramina, and among those used as food by man, it has been observed on barley, oats, spring wheat, winter wheat, and rye. But the rye seems peculiarly subject to it, almost all the poison which has caused epidemics, as well as what is now used in medicine, being produced by that grain.*

760. With regard to the effects of spurred rye on man, it has been found by express experiment, that in a single dose, two drachms for example, it excites giddiness, headache, flushed face, pain and spasms in the stomach, nausea and vomiting, colic,

---

* By a late analysis of ergot, made by Mr. Wiggins, of Berlin, it has been found that this substance contains a proximate principle analogous to that obtained from mushrooms, and which has been called vegetable osmazome. In this principle seems to reside the power of ergot to promote parturition. In another principle, *insoluble in water,* called *ergotine,* Mr. W. says the *poisonous* qualities reside; for he found that on several animals this latter principle operated as a powerful irritant poison, while the osmazome produced no such effect. It is, nevertheless, generally stated by toxicologists, that ergot imparts its properties to water and alcohol.

purging, and a sense of weariness and weight in the limbs.

761. Its more common effects, however, form a peculiar disease, which has often prevailed epidemically in different territories on the continent, and which arises from the spur being allowed to mix with the grain in the meal, and being taken as food for a continuance of time in rye-bread. The affection produced differs much in different epidemics and even in different cases of the same epidemic. Two distinct sets of symptoms have been noticed.

762. The first form of disease, the *convulsive ergotism* of the French writers, is described. 1. In its most acute form, as commencing suddenly with dimness of sight, giddiness, and loss of sensibility, followed soon by dreadful cramps and convulsions of the whole body, *risus sardonicus*, yellowness of the countenance, excessive thirst, excruciating pains in the limbs and the chest, small, often imperceptible pulse; and such cases usually proved fatal in twenty-four or forty-eight hours.—2. In the milder cases the convulsions came on in paroxysms, were preceded for some days by weakness and weight of the limbs, and a strange feeling, as of insects crawling over the legs, arms and face; in the intervals between the fits, the appetite was voracious, the pulse natural, the excretions regular; and the disease either terminated in recovery with scattered suppurations, cutaneous eruptions, anasarca or diarrhœa, or it proved in the end fatal amidst prolonged sopor and convulsions.

763. The other form of disease, which has been named *gangrenous ergotism* by the French writers, and is known in Germany by the vulgar name of creeping sickness *(kriebelkrankheit,)* has been minutely described by various authors. 1. In the most severe form, it commences with general weakness, weariness, and a feeling as if of insects creeping over the skin; when these symptoms have lasted some days or weeks, the extremities become cold, white, stiff, benumbed, and at length so insensible, that deep incisions are not felt; then excruciating pains in the limbs supervene, along with fever, headache, and sometimes bleeding from the nose; finally, the affected parts, and in the first instance the fingers and arms, afterwards the toes and legs, shrivel, dry up, and drop off by the joints. A healthy granulation succeeds; but the powers of life are frequently exhausted before that stage is reached. The appetite, as in the convulsive form of the disease, continues voracious throughout. 2. In milder cases, nausea and vomiting attend the precursory symptoms, and the gangrenous affection is accompanied with dark vesications. 3. In another variety the chief symptoms are spasmodic contraction of the limbs at first, and afterwards weakness of mind, voracity and dyspepsia, which, if not followed by recovery, as generally happens, either terminates in fatuity or in fatal gangrene.*

---

* *Treatment of Poisoning with Spurred Rye.*—An emetic should be immediately administered to expel the poison, fol-

2. *Of Poisoning with Spurred Maize.*

764. It appears that Indian corn or maize, the *Zea mays* of botanists, is also very subject to the spur in some provinces of Colombia, South America. The spur forms a black, pear-shaped body on the ear in place of the pickle; and in this state the grain, which is known by the name of *mais peladero*, possesses properties injurious to animal life.

765. Its effects are somewhat different from those of spurred rye. Men who eat the ergotted maize lose their hair, and sometimes their teeth, but are never attacked with dry gangrene or convulsions.

3. *Of Poisoning with Darnel-grass.*

766. The seeds of the Darnel-grass (*Lolium temulentum*) appear to be powerfully narcotic and at the same time to possess acrid properties.

766. When mixed with bread and taken habitually by man, darnel-grass has been known to cause headache, giddiness, somnolency, delirium, convulsions, paralysis, and even death. It has been found that soon after eating bread containing darnel-grass flour, there was experienced confusion

---

lowing it up with demulcents. When the symptoms of gangrene have made their appearance, opium should be given, and it has even been recommended to administer brandy punch, to the extent of producing considerable inebriation; but then this state must be cautiously kept up till the disorder is got under.

of sight, and ideas, languor, heaviness, and alternate attacks of somnolency and vomiting. The bread was commonly vomited soon after eating it. Some cases are related in which the somnolency was more deep, and tremors are almost always present.

SECT. XI. *Of Poisoning with Alcohol, Ether, and Empyreumatic Oils.*

767. The last group of the narcotico-acrids comprehends alcohol, ether, and the empyreumatic oils.

1. *Of Poisoning with Alcohol.*

768. Alcohol has been generally believed to act on the brain through the medium of the nerves, and to do so without entering the blood; but this may be doubted. Through whatever channel it may operate there is little doubt that it does enter the blood; for in man the breath has a strong smell of spirits for a considerable time after they are swallowed. When injected into the cellular tissue alcohol is a violent poison; and it produces through that channel the same effects as when taken into the stomach. When injected into the cavity of the chest it acts with great rapidity. Three degrees in the immediate effects of alcohol have been distinguished.

769. When the dose is small, much excitement and little subsequent depression are produced.

770. When the effect is sufficiently great to receive the designation of poisoning, the symptoms

are more violent excitement, flushed face, giddiness, confusion of thought, delirium, and various mental affections, varying with individual character. These symptoms are soon followed by dosing and gradually increasing somnolency, which may at length become so deep as not to be always easily broken. After the state of somnolency has continued several hours, it ceases gradually, but is followed by giddiness, weakness, stupidity, headache, sickness and vomiting.

771. This degree of injury from alcohol may prove fatal, either in itself, by the coma becoming deeper and deeper, or more frequently from the previously excited state of the circulation causing true apoplexy in a predisposed habit, or still more frequently from the occurrence of some trifling accident, which in his torpid state the individual cannot avoid or remedy, such as exposure to cold, falling with the face in mud or water, suffocation from vomited matters getting into the windpipe, and the like.

772. In cases of simple poisoning in the second degree, the progress of the symptoms is on the whole remarkably uniform, gradual and uninterrupted. But there are likewise some anomalies. Thus, occasionally after the phenomena of ordinary intoxication have gone on gradually increasing without having attained a very great height, sudden lethargy supervenes at once, and may prove fatal with singular rapidity. An anomaly of a different kind is sudden supervention of deep insurmountable stupor, without the usual precursory

symptoms, yet not till after a considerable interval subsequently to drinking.

773. The ordinary duration of the present form of poisoning with alcohol in fatal cases, no accidents supervening, seem to be from twelve to eighteen hours.

774. The third degree of poisoning with alcohol is not so often witnessed, because in order to produce it, a greater quantity of spirits must be swallowed pure and at once, than is usually taken by those among whom poisoning in the second degree chiefly occurs. When swallowed in large quantity, there is seldom much preliminary excitement: coma comes on in a few minutes, and soon becomes profound, as in apoplexy. The face is then sometimes livid, more generally ghastly pale; the breathing stertorous, and of a spirituous odor; the pupils sometimes much contracted, more commonly dilated and insensible; and if relief is not speedily procured, death takes place,—generally in a few hours, and sometimes immediately.

775. It has been stated of the third degree of poisoning with alcohol, that the patient will recover if the iris remains contractile, but if it is dilated and motionless on the approach of a light, recovery is very improbable.

776. Alcohol also appears to act sometimes as an irritant. After its ordinary narcotic action passes off, another set of symptoms occasionally appear, which indicate inflammation of the alimentary canal.—A young man at Paris had been drinking

brandy immoderately for several successive days, when at length he was attacked with shivering, nausea, feverishness, pain in the stomach, vomiting of every thing he swallowed except cold water, thirst, and at last hiccup, delirium, jaundice, and convulsions; and death took place on the ninth day. On examining the body, the stomach was found gangrenous over the whole villous coat; the colon too was much inflamed; and all the small intestines were red.

777. Besides the immediately fatal effects of spirituous liquors now described, there is still another variety of poisoning more common than any yet mentioned, and constituting a peculiar disease. People who fall into the unhappy vice of habitual intoxication, after remaining in a state of drunkenness for several days together, are often attacked with a singular maniacal affection, which is accompanied with tremors of the limbs, particularly of the hands, and after enduring for several days, ends at last in coma. When the delirium is not violent, the disease by proper treatment may be cured. But frequently after the delirium and tremor have continued mildly for some time, they increase, and the delirium becomes furious, or coma rapidly supervenes; in either of which cases the disorder commonly proves fatal in two or three days more. This disease, which is now familiar to the physician, is called *delirium tremens*. It is supposed by some to depend on inflammation of the members of he brain, followed by effusion.

778. Other diseases, besides *delirium tremens*, are slowly induced by the habitual and excessive use of spirituous liquors; but in general the habit of intoxication acts in inducing those diseases only as a predisposing cause. The following have been enumerated among the diseases where this habit acts powerfully as a predisposing cause—indurated pancreas—indurated mesenteric glands—scirrhous pylorus—catarrh of the bladder—inflammation, suppuration, and induration of the kidneys—incontinence of urine—aneurism of the heart and great vessels—apoplexy of the lungs—varicose veins—mania—epilepsy—tendency to gangrene of wounds—spontaneous combustion.

779. Some doubts exist as to the *morbid appearances* in the bodies of those poisoned by overdoses of spirituous liquors.

780. In man the signs of irritation have not been always observed.

781. The state of the brain differs much according to the mode of death. Sometimes great congestion and even actual extravasation of blood are found in the heads of persons who have died of excessive continuous drinking,—the excitements of such a debauch being apt to induce apoplexy in a predisposed habit. In one case, an enormous extravasation of clotted blood was found in the ventricles, producing extensive laceration of the right, middle and anterior lobes of the brain. In such cases, it is natural to suppose, that a predisposition to apoplexy must have concurred with the intoxi-

cation; otherwise, it is not easy to see why death from extravasation, is not more frequently produced by excessive drinking.

782. Extravasation is not apt to occur in the cases of rapid death brought on by a very large quantity swallowed at once. The circulation, indeed, is during life, in a state quite the reverse of excitement; and accordingly the brain and its membranes are found quite healthy.

783. When delirium tremens proves fatal, effusion is commonly found among the membranes of the brain; and occasionally to a very great extent. In one instance, which proved very quickly fatal, there was seen minute vascularity of the membranes with effusion of fibrin, and without effusion of serosity; but such cases are rare. There is also very extensive softening of the mucous coat of the stomach. In an instance mentioned, besides effusion into the cerebral membranes, there was found an enormous accumulation of fat in all the cavities, a conversion of the muscular substance into fat, and a nauseous sweet smell from the whole body.

784. In all cases of rapid poisoning with spirituous liquors, some of the poison will be found in the stomach. But when the individual has survived the taking of the poison a considerable length of time, an odor of spirits will not be perceived either in the stomach or elsewhere. In such cases the poison disappears during life by absorption.

2. *Of Poisoning with Sulphuric and Nitric Ether.*

785. Sulphuric ether and nitric ether are poisons of the same nature with alcohol. But the effects produced by them when taken in considerable doses are not very well known.

786. *Sulphuric ether* appears to act energetically even in small doses. In moderate quantity it produces a strong sense of irritation in the throat, a feeling of fulness in the head, and other symptoms like those excited by nitrous-oxide gas. A gentleman, in consequence of inhaling it too long, was attacked with intermitting lethargy for thirty-six hours, depression of spirits, and lowness of pulse. When long and habitually used, for example by persons afflicted with asthma, its dose must be gradually increased; and it appears that considerable quantities may then be taken for a great length of time without material injury.

787. *Nitric ether* in vapour has been shown to be a dangerous poison when too freely and too long inhaled. A druggist's maid-servant was found one morning dead in bed, and death had evidently arisen from the air of her apartment having been accidentally loaded with vapor of nitric ether, from the breaking of a three gallon jar of the *Spiritus Etheris Nitrici.* She was found lying on her side, with her arms folded across the chest, the countenance and posture composed, and the whole appearance like a person in deep sleep. The stomach was red internally, and the lungs were gorged.

3. *Of Poisoning with Empyreumatic Oils.*

788. It has been already mentioned, (643,) that the empyreumatic oil of tobacco is an active poison; and that the emanations from candle snuffings, (605,) and imperfectly consumed tallow probably owe their injurious properties to a peculiar oil. Many empyreumatic oils are known, and some are used in medicine, which act powerfully on the animal system as stimulants and antispasmodics. Among these may be enumerated naphtha, beech oil, oil of guiajac, oil of galbanum, oil of amber, oil of wax, and Dippel's oil.

789. The following is a case of poisoning with the impure oil of hartshorn, from which the oil of Dippel is prepared by rectification. The subject was a woman who took it intentionally in the dose of an ounce and a half. The symptoms induced could not be ascertained; but it appeared that she had been attacked with vomiting, and, finding the action of the poison either less speedy or less supportable than she could wish, had thrown herself into a well and been drowned. The appearances in the body clearly showed that in this instance the poison had not acted as a pure narcotic. The whole body exhaled the peculiar fetid odor of the oil. The palate, tongue, throat, and gullet, were white and shrivelled. The stomach had outwardly a diffuse rose tint, crossed by gorged black veins, which here and there had burst and formed patches of extravasation. The contents of the stomach

consisted of remains of food, a good deal of the oil, some water, and likewise some extravasated blood. Its villous coat was thick, covered with red points, corrugated into prominent rugæ, but not eroded. The intestines also presented signs of irritation, but in an inferior degree.

790. *Oil of turpentine* possesses somewhat similar properties; but is much less active. On man its effects are capricious. It has been at times administered in very large doses, for example in the quantity of two, three, or four ounces, without any other effect than brisk purging. But on the other hand it has sometimes, in much inferior doses, induced violent hypercatharsis, or acted severely on the urinary organs, producing strangury and bloody micturition, or affected the brain, producing a state like intoxication, followed by trance for many hours.

CHAPTER XII.

OF COMPOUND POISONING.

791. When two poisons of different or opposite properties are administered about the same time in poisonous doses, the effects of the one may overpower and prevent the operation of the other, or they may merely modify the action of one another. In this manner the usual symptoms produced by one or by both, may be entirely, or in a great measure wanting; and even in the dead body the usual appearances occasioned by one or both may be modified or perhaps altogether absent.

792. It is probable that the modifying influence is established in one of two ways, either by one poison producing a state of venous plethora or distension, which impedes, or for a time prevents, the absorption of the other, or by one poison producing an insensibility of the membrane with which the other is in contact; so that not only the local injury actually done has not the usual remote effect on the constitution, or on distant organs, but likewise is at times, substantially less extensive than in ordinary circumstances.

APPENDIX A.

ON THE ADULTERATION BY COPPER OF ARTICLES OF FOOD AND DRINK.

It is important to the medical practitioner, and even to the public at large, as well as to the medical jurist, to know the circumstances, so far as they have been investigated, under which the use of copper vessels, in the preparation of food, has given rise to unpleasant or fatal accidents. The object of this Appendix is to furnish such information on the subject as may be deemed of practical utility.

Of the Action of Water, &c. on Copper.—Distilled water, kept several weeks on a polished plate of copper, neither injured its lustre, nor acquired any taste, nor became colored with ammonia; kept for a month on copper filings, it did not contain any of the metal. But water containing a considerable quantity of common salt, as four ounces in five pounds, or a twentieth part, will give slight traces of copper after being boiled in a *brass* pan. If the pan be made of copper, a powder is procured by evaporation, which, when treated with acetic acid, yields so much as twenty grains of acetate of copper. It is a singular circumstance, however, that if beef or fish be boiled with the usual allowance of salt, and with the addition, also, of various vegetable substances, the liquid does not yield any copper. Hence copper vessels, although they have often been the source of fatal accidents, if carefully used, in the preparation of food, have appeared, under careful management, to be quite harmless. Several other saline matters, besides common salt, promote the solution of copper in water. Alum has this effect, when aided by heat; and probably nitre and epsom salts possess the same quality.

If the copper vessel be well cleaned, *milk*, tea, coffee, beer, and rain water, kept in a state of ebullition for two hours, do not contract the slightes impurity from the metal; and the same remark has also been made with respect to cabbage, potatoes, turnips, carrots, onions, rice and barley.

Of the Action of Acids on Copper.—When the copper vessel is not thoroughly clean, all acid substances dissolve the carbonate that encrusts it, especially if left in it for some time. Nay, it appears that some acid matters, though they do not dissolve clean copper by being merely boiled in it a few minutes, nevertheless, if allowed to cool and stand some time in it, will acquire a sensible impregnation. *Syrup of lemons*, boiled fifteen minutes in copper or brass pans, did not acquire a sensible impregnation; but if it was allowed to cool, and to remain in the pans for twenty-four hours, the impregnation was perceptible even to the taste, and was discovered by the test of metallic iron. In the same manner, in preparing food or preserves in copper, it is not till the fluid ceases to cover the metal, and is reduced in temperature, that the solution of the metal begins. Inattention to this difference has been the cause of many fatal accidents. *Wines*, at least some wines, have the same power of dissolving copper, by reason of the acid they contain. Hence twenty-one grains of the acetate were found in five pounds of French white wine, after being boiled in a copper vessel. *Vinegar* also dissolves metallic copper. Hence it has been found in vinegar pickles, prepared in copper vessels. It seems, indeed, to have been, at one time, the custom to make it a point of adulterating pickles with copper; for in many old cookery books, the cook is told to make her pickles in a copper pan, or to put some halfpence among the pickles, to give them a fine green color.

The action of the vegetable acids, and more particularly that of vinegar on copper, depends on the co-operation of the atmospheric air held in solution by the fluid, and in contact with its surface. Without such co-operation the copper cannot be oxidated. This fact explains why it is not dangerous to *boil* acidulous liquids in copper vessels, while it is very unsafe to keep these fluids *cold* in the same vessels. In the latter instance the liquid is impregnated with atmospheric air, while in the former the usual aeriform contents are driven off by heat. It has been observed, however, that strong vinegar, as the pyroligneous acetic acid, will become impregnated to a certain extent if boiled in copper vessels.—The action which takes place is the same as that remarked in the case of cold vinegar:—the copper, where it is always covered, remains quite bright; but at the edge of the fluid it becomes oxidated, and the oxide is dissolved by the occasional bubbling up of the acid.

Of the Action of Fatty Matter and Oils on Copper.—The property of oxidating and uniting with copper, is likewise possessed by fatty matters and oils. These will act even when fresh, provided they be aided by the co-operation of atmospheric air. It has been observed, that if a plate of copper be thrust into a mass of fresh butter, its surface becomes dark in twenty-four hours, and the butter becomes green wherever it is in contact both with the copper and the air; but not when it covers the metal closely. In *fresh hog's lard*, however, it was found that the whole lard in contact with the copper becomes blue, even at a depth to which the air can scarcely reach.—The action of *oils* is similar. It is even probable that they act when hot; for it was found that hot oil became green when kept for only four or five minutes in a copper vessel. The property of acting on copper is said to be possessed in an eminent degree by volatile oils, and especially by *oil of cloves* and *oil of cinnamon.*

Of the Adulteration of Bread with Copper.—It appears that the sulphate of copper has been used in small quantity for promoting the fermentation of the dough in the process of panification. The practice was first detected in some of the towns of Flanders. The correctional tribunal of Brussels, on one occasion, condemned thirteen bakers for mixing sulphate of copper with their bread.* The practice has also been since found to prevail in France, where the subject has been more thoroughly examined into. From the experiments of M. Sarzeau, it would seem that when the sulphate of copper used has been the 1-5620th part, by weight, of the flour employed in making the bread, its poisonous effects will be decidedly experienced; and that the intentional adulteration of the bread with this salt may be concluded, whenever the ashes of the bread give copper by the action of the blowpipe.† Some doubts may certainly be entertained whether any injury can result to the human body, from even the habitual use of so small a

---

[*] SILLIMAN'S JOURNAL, vol. xx. p. 270.

[†] *Journal de Chimie Médicale, de Pharmacie et de Toxicologie.* April, 1832.

quantity as is commonly employed by the bakers—and, at all events, we may be satisfied that if any bad effects do result, this can only happen from the continual use of the adulterated bread for a great length of time. But there can be no doubt that the practice is a serious fraud on the public, by enabling the baker to make his loaves of the standard weight with a less allowance of nutritive material.

APPENDIX B.

ON THE ADULTERATION BY LEAD OF ARTICLES OF FOOD AND DRINK.

A knowledge of the various ways in which lead is liable to be insidiously introduced into the body, either by the action of chemical agents, or by the intentional sophistication of articles of food and drink, is no less interesting to the medical practitioner, than a similar information as regards copper. The following will afford a summary of the most important facts that have been ascertained on this subject.

Of the Action of Air and pure Water on Lead.—When lead is exposed to the air it becomes tarnished. This arises, not from oxidation, as some have imagined, but from a thin crust of *carbonate* of lead being formed. The formation of this carbonate is accelerated by moisture, and probably by the presence of an unusual proportion of carbonic acid in the air.

Distilled water, deprived of its gases by ebullition, and excluded from contact with the air, has no action whatever on lead. If the water contain the customary gases in solution, the surface of the metal, freshly polished, becomes quickly dull and white. But if the surface of the water be not at the same time exposed to the air, the action soon comes to a close. When the air, on the other hand, is allowed free access to the water, a white powder appears in a few minutes around the lead; and this goes on increasing, till in the course of a few days there is formed a large quantity of white, pearly scales, which partly float in the water, but are chiefly deposited on the bottom of the vessel. The process of corrosion goes on so long as atmospheric air is allowed to play freely on the surface of the water, but gradually becomes less and less, provided the water be not occasionally shaken, to prevent the adhesion of the powder to the surface of the lead. The metal thus dissolved by the aerated water is in the state of a carbonate.

Of the Action of Solutions of Neutral Salts on Lead. The property which *pure* aerated water possesses of corroding lead is variously affected by foreign ingredients which it may hold in solution. Of these modifying substances none are more remarkable in their action than the neutral salts, which all impair the corrosive power of the water. The degree of this preservative power differs much in different salts. Muriate of soda, (*common salt*,) preserves in the proportion of a 2000th part to the water, sulphate of lime in the proportion of nearly a 4000th part, and *alum* in about the same proportion as the sulphate of lime. The preservative power seems to depend on the acid, not on the base of the salt. So that it would appear, that those whose acid forms with the lead a soluble salt, are the least energetic; while those whose acid forms an insoluble salt of lead are most energetic.—There are, however, some natural causes by which the preservative power of the neutral salts is impaired. This topic has not hitherto been satisfactorily examined; but it may be stated that one of the most common counteracting causes in natural waters, will be found to be the co-existence of an unusual quantity of carbonic acid.

Of the Action of Natural Waters on Lead.—Rain or snow water, collected in the country at a distance from houses, and before it touches the earth, being nearly as pure as distilled water, will act with almost equal rapidity on lead. Even when collected in a great city, and in circumstances which, at first sight, would appear not very favorable to its action—for example, from eaves-droppings a few hours after the beginning of a shower—it retains a little of its corroding power; and when collected in like manner after twelve or twenty-four hours' rain, it corrodes almost as rapidly as distilled water. Hence, perhaps, even in a town, but at all events, certainly in the country, it would be wrong to use, for culinary purposes, rain or snow water, which has run from lead roofs or spouts recently erected. When the roof or spout has been exposed for some time to the weather, the danger is, of course, much lessened, if not entirely removed; because exposure to the weather encrusts it with a firmly adhering coat of carbonate, through which even distilled water will not act. But it would still be right to condemn the turning even of old leaden roofs to the purpose of collecting water for the kitchen. For, although the purest rain water cannot act on them when it is once fairly at repose, we do not know what may be the effect of the impetus of the falling rain on the crust of carbonate; and if the crust should happen to be thus worn considerably, or detached by mere obvious accidents, the corrosion would then go on with rapidity as long as the shower lasted.

Most *spring waters*, unlike rain or snow water, have little or no action on lead, because they generally contain a considerable proportion of muriates and sulphates. There are, however, several instances on record of spring waters which act with inconvenient or dangerous rapidity on lead.

Of the Action of Acidulous Fluids on Lead and its Oxide.—Water which is acidulated with various acids acts on lead with different degrees of rapidity. If acidulated with *carbonic acid*, as already mentioned, it acts so energetically as in part to counteract the preservative power of the neutral salts. The effect of *sulphuric acid* is peculiar. Distilled water feebly acidulated with that acid acts much less rapidly on lead than when quite pure. *Muriatic acid* is somewhat more active as a solvent.

Acetic acid in the form of common vinegar, even when much diluted, attacks and dissolves metallic lead, if, by exposing the surface of the fluid to air, a constant supply of oxygen be maintained to produce oxidation. The *Citric acid* will attack it under the same circumstances, but acts more slowly. *Tartaric acid* acts much less energetically. From this action of the vegetable acids, it follows that the preparation or preservation of articles of food and drink in leaden vessels is fraught with danger. For, if they contain a vegetable acid, more particularly the acetic, as many of them do, and if they are allowed to remain in the vessel for a moderate length of time, they will be apt to be impregnated with the metal. In this way lead has been often insidiously introduced into the food of man. Thus *milk* has been poisoned by being kept in leaden troughs. *Wine* has been accidentally impregnated in like manner, in consequence of the bottles having been rinsed with shot, and some of the shot left behind. *Cider* is peculiarly liable to the same adulteration.

If the lead be previously oxidated, the presence of vegetable acids in articles kept in contact with it is still more likely to give rise to a poisonous impregnation; and the presence of air is of course not required to enable them to effect its solution. Of accidental adulterations of this kind the most important is that which arises from the action of vegetable acids on the glazing of earthenware. This glazing is well known to contain generally a considerable quantity of oxide of lead, and in consequence is more or less easily dissolved by the vegetable acids.

On the other hand, the solvent powers of the acids is liable to be counteracted by various substances; but the operation of these substances has not been well ascertained. It appears, however, that substances containing *gallic acid* or tannin throw down the lead; and on this account various adulterations which would otherwise take place are either prevented or corrected. It has been also ascertained, that the vegetable acids do not attack lead when it is alloyed with tin. For as the latter metal has a stronger attraction than the former for the acids, no lead can be oxidated before the tin undergoes that change.

Finally, confectioners and apothecaries should know that some distilled waters of aromatic plants act powerfully on lead. This has been particularly observed of the orange-flower water.

Of the Prophylaxis, or mode of preventing the influence of the poison of Lead.—The first thing to be considered is cleanliness, to secure which three points should be attended to. In the first place, the face and hands should be washed once a day at least, the mouth well rinsed, and the hair occasionally combed. Secondly, frequent bathing is of great consequence both with a view to cleanliness and as a general tonic. Lastly, the working clothes should be made not of woollen, but of strong, compact linen, should be changed and washed at least once and still better twice a week, and should be worn as little as possible out of the workshop. *While at work a cap of some light impervious material should always be worn.*

Next to cleanliness the most important article of the general prophylaxis relates to the means to be employed for preventing the food of the workmen from being impregnated with the lead. For this end it is essential that they never take their meals in the workshop, and that before eating they wash the lips and hands with soap and water, and brush out all particles of dirt which may have lodged under the nails. It is also of some moment that they breakfast before going to work in the morning.

Derangements of the digestive organs should be watched with great care. If they appear to arise from the poison of lead, the individual should leave off work with the very first symptom, and should take a laxative. Habitual constipation should be provided against.

The nature of the diet of the workmen is of some consequence. It should be, as far as possible, of a nutritive and digestible kind. Various articles of diet have been recommended, as tending to impede the operation of the poison. There is some reason for believing that the free use of fat and fatty articles of food is a preservative. Some have likewise proposed, as an additional preservative, that the exposed parts of the body should be anointed with oily or fatty matter. But it is maintained, with some reason, that the lead will be thereby enabled to penetrate the cuticle more easily by friction and pressure.

The workshop should be spacious, and both thoroughly and systematically ventilated; the external air being freely admitted when the weather will allow, and particular currents established, by which floating particles are carried through the workshop in certain invariable and known courses. Miners, and others who work at furnaces in which lead is smelted, fused, or oxidated, should be protected by a strong draught through the furnaces. Manufacturers of litharge and red lead used formerly to suffer much in consequence of the furnaces being so constructed as to compel them to inhale the fine dust of the oxides. In drawing the furnaces the hot material is raked out upon the floor, which is two or three feet below the aperture in the furnace; and the finer particles are therefore driven up and diffused through the apartment. But this obvious danger is now completely averted by a subsidiary chimney, which rises in front of the drawing aperture, and through which a strong current of air is attracted from the apartment—the hot material on the ground performing the part of a fire.

In white lead manufactories a very important and simple improvement has been effected of late, in some places, by abandoning the practice of dry grinding. In all manufactories of the kind, the ultimate pulverizing of the white lead has been long performed under water. But in general the preparatory process of rolling, by which the carbonate is separated from the sheets of lead on which it is formed, continues to be executed dry. This is a very dangerous operation, because the workmen must inhale a great deal of the fine dust of the carbonate. In an extensive white lead manufactory at Portobello, the process is entirely performed under water, or with damping; and to this precaution, in a great measure, are imputed the improvement which has taken place in the health of the workmen, and their superior immunity from disease over those of other places, where the same precaution is not taken. The only operation now considered dangerous, at the Portobello works, is the emptying of the drying stove and the packing of white lead in barrels; and the dust which is then diffused is kept down, as much as possible, by the floor being maintained constantly damp. By these precautions, and by care being taken to make the workmen wash their hands and faces before leaving the works for their meals, and to administer a brisk dose of castor oil on the first appearance of any complaint of the stomach or bowels, the manufacturer succeeded in extirpating the colica pictonum entirely for several years.

GENERAL INDEX.

ABSORPTION, action of poisons through, 22
Acetate of copper, 132, 135
Acetate of lead, effects of, 148
Acid, Acetic, concentrated, 74
irritant action of, 73
poisoning with, 73
varieties of, 73
arsenious. See *Arsenic*.
botulinic, 200
carbonic gas, poisoning with, 244
how disengaged, 244
effect of diluted, 245
caution respecting, 245
treatment for, 247
morbid appearances produced by, 247
chromic, poisoning with, 145
hydrochloric gas, 77
hydrocyanic, poisoning with, 225
preparation of, 226
salivation by, 227
symptoms of poisoning by, 226
antidotes to, 229
morbid appearances of poisoning by, 231
period at which fatal, 228
vegetables containing, 233
meconic, 219, 221
Acids, mineral, 50
mode of action, 50, 51
on man, 51
symptoms from, 51, 53, 54
duration of, 53
treatment of poisoning by, 54
quantity required, 53
antidotes to, 55, 56
appearances caused by, 56
bases of, 62
Acid, Muriatic, 77
nitric, evidence of, 54
sulphuric, evidence of, 54
dysphagia from, 54
oxalic, antidotes to, 71
concentrated, 66
dilute, 66
effects on texture, 68
evidence of, 70
morbid appearances from, 71
poisoning with, 66
symptoms of poisoning by, 68
treatment of poisoning by, 71
Aconita, 268
Aconitum napellus, 268
Acrids, animal, poisoning with, 183
narcotico, 251
effects of, 251
morbid appearances from, 252
whence derived, 252
vegetable, mode of action of, 163
morbid appearances from, 165
Acrid principle of ranunculus, 167
Action of acids on copper, 322
on lead, 328
air and pure water on lead, 325
natural waters on lead, 327
fatty matter and oils on copper, 323
Action of ammonia and its salts, 91
arsenic, twofold, 99
general opinion respecting, 100
remote, 100
energy of, 101
copper and salts, 132
mineral acids on man, 51
morphia, 219
narcotics, 203
narcotine, 219, 220

nitrate of potassa twofold, 86
nitrate of Lime, 98
opium, mode of, 205, 206
Action of poisons, 21
through absorption, 22
sympathy, 22
local, 21
remote, 21
varieties of local, 22
organs affected by, 23, 24
causes which modify, 25
vegetable acrids, 163
Action of water on copper,
Adulteration by copper of articles of food and drink, 321
of bread, 324
Adulteration by lead of articles of food and drink, 325
Æthusa cynapium, 267
Alcohol, degrees of poisoning with, 311, 312, 313
irritant action of, 313
morbid appearances from, 315
Alkalis and alkaline salts, effects of, 80
diluted and concentrated, 80
fixed, antidotes to, 84
Alkalis, fixed and carbonates of, 81
poisoning with, 81
mildest form of, 83
worst forms of, 82
morbid appearances from, 84
symptoms of, 82
treatment of, 84
Alkaline nitrates, 85
sulphurets, 95
antidotes to, 97
morbid appearances from, 97
treatment for, 97
Almond, bitter, poisoning with 234
dwarf, 239
Amanatine, 298
Amanita muscaria, 299
citrina, 301
American hemlock, 266
nightshade, 271
ipecacuanha, 271
Ammonia and its Salts, 90, 91
action of, 91
water of, treatment of poisoning with, 92
effects when swallowed, 93
Ammonia, effects when inhaled, 93
Ammonia, morbid appearances from, 94
muriate of, 94
tungstate of, 160
molybdate of, 159
Ammoniacal gas, 78
Ammoniated mercury, 126
Amygadalaceæ, general properties of, 234
Amygdalus nana, 239
Anacardium occidentale, 290
Analysis of Ergot, 306
Anemone pulsatilla, 165
Angustura False, 278, 285
Animal acrids, 183
matter diseased, 193
decayed, 193
rendered poisonous by morbid action, 193
common putrefaction, 197
modified putrefaction, 198
irritants, 163
Animals, flesh of, afflicted with carbuncular disease, 195
Antidotes, 33
chemical, 33
selection of, 33, 34
by cupping glasses, 34
by ligature, 34
Mr. Verniere's, 35
to the mineral acids, 55, 56
Strychnia, 200
the cucurbitacæ 170
sulphate of zinc, 147
lead, 152
salts of baryta, 158
tin, 140
sulphurous acid gas, 79
muriatic acid gas, 77
alkalis and their carbonates, 84
oxalic acid, 71
mercury, 128
copper, 134
alkaline sulphurets, 97
opium, 216
morphia, 221
prussic acid, 229
sulphuretted hydrogen gas, 242
iron, 162
veratra, 273
Antimony, poisoning with, 136
preparations of, 136
muriate of, 136

Apocyneæ, 271
Apocynum androsæmifolium, 271
Arsenic, preparations of, 99
  twofold action of, 99
  remote action of, 100
  symptoms of poisoning with, 101, 106, 107
  treatment of do. do. 108
    Dr. Thompson's, 109
  morbid appearances from, 112
  effects on bodies poisoned by 117
Arseniate of ammonia, 100
  iron, 100
  soda, 100
Arsenious acid, 99
Arsenite of copper, 99
  potassa, 99
Arum maculatum, 180
  triphyllum, 180
Ash, mountain, 240
Atropa Belladonna 254
Atropia, 255
Bacon, poisonous, 198, 201
  symptoms of poisoning with, 201
Barium, 156
Baryta, salts of, 156
  symptoms of poisoning with, 157
  administered medicinally, 157
  treatment of poisoning by, 157
  antidotes to, 153
  morbid appearances from, 158
Bee, sting of, 191
Belladonna, 254
  treatment of poisoning by, 258
  morbid appearances from, 258
  extract of, 255
  duration of the effects of, 257
Bichloride of mercury, See *Corrosive Sublimate.*
Bichromate of potassa, poisoning with, 144
  treatment of, 144
Bismuth, poisoning with, 141
  preparations of, 141
  symptoms of poisoning induced by, 141
  morbid appearances from, 142
  treatment of poisoning by, 142
Biting stone-crop, 180
Bitter almond, 234
Bitter apple, 171
Bitter cassada, 176
Bitter sweet, 223
Black cherry, 239
Black drop, 205
Black hellebore, 270
  morbid appearances from, 270
  symptoms of poisoning with, 270
Botulinic acid, 200
Bromine, 66
Brucea antidysenterica, 285
Brucia, 285
  experiments with, 285
  salts of, 285
  relative strength of, 285
  symptoms of poisoning with 286
Bryonia alba, 170
Bryonia, 171
Bullace, 239
Butter of Antimony, 136
Cadmium, muriate of, 161
Calomel, 126
Caltha palustris, 168
Camphor, poisoning with, 288
  irritant properties of, 291
Cantharides, poisoning with, 183
    symptoms of, 183
    treatment of, 187
  quantity required to poison, 186
  morbid appearances caused by, 187
Cantharis vittata, 184
  cinerea, 184
  atrata, 184
  marginata, 184
Carbonate of ammonia, 90, 91
  baryta, 156
  lead, 148
    formed by the action of air and pure water, 325
Carbonates of potassa and soda, 81
Carbonic acid gas, effects of, 245
    poisoning with 244
    caution respecting 245
    how disengaged 244
    treatment of poisoning with, 247
    morbid appearances from, 247
  oxide gas, poisoning with, 248
Carburetted hydrogen gas, poisoning with, 244
Carbuncular disease in animals 195
Cashew nuts 290
Castor oil, 174
Cattle over-driven, 194
Celandine, 169
Cerium, muriate of, 161
Cheese, poisonous, 201
Chelidonium majus, 169

Cherry laurel, 236
Chlorine gas, 77
Chromium, 143
Chromate of potassa, 143
Chromic acid, 145
Cicuta virosa, 265
  maculata, 266
Cinnabar, 126
Cider, adulteration of, by lead, 329
Classification of poisons 37
Clematis, 169
Cluster cherry, 238, 239
Cobalt, poisoning with, 160
  preparations of, 160
Cocculus indicus, poisoning with, 288, 292
Colchicum, 273, 274
  morbid appearances from, 275
  officinal preparations of 275
Colica-pictonum, 148, 150
  palsy from, 151
  treatment of, 153
  mode of preventing it in lead works 330, 332
Colocynth, 171
Colocynthin, 171
Common cherry, 239
Compound poisoning, 320
Conia, 263
Conium maculatum, 263
  extract of, 264
Convolvulus jalapa, 178
  scammonea, 179
Copper, poisoning with, 132
  action of its salts, 132
  symptoms of poisoning with, 132
  preparations of, 132
  treatment of poisoning with, 134
  morbid appearances from, 134
  antidotes to, 134
  adulteration by, of articles of food and drink 321
   bread, 324
Coriaria myrtifolia, poisoning with, 288, 293
Corrosive sublimate, poisoning with, 119, 120
  effect of organic solids and fluids on, 120
  duration of the effects of, 122, 123
  use of as a remedy, 124
  antidote to, 128
  treatment of poisoning with 128
Croton Tiglium, 181
Cubebs, 182
Cucumis colocynth, 171
Cucurbitaceæ, poisoning with, 169
  essential characters of, 169
   antidote to, 170
Curare, poisoning with, 278, 287
Cured salmon, 202
Cupping-glass, use of, 34
Cyanide of mercury, 126
Cyanogen gas, 249
Daffodil, 177
Daphnina, 177
Darnel Grass, 310
Datura Strammonium, 259
Daturia, 259
Delirium tremens, 314
Delphinia, 168
Delphinium staphysagria, 168
Digitalis purpurea, 275
  officinal preparations of, 275
  effects of, 276
  symptoms from gradual accumulation, 266
  morbid appearances from, 277
  treatment of poisoning with, 277
Division of poisons, 37
Dogbane, 271
Dragon root, 180
Dulcamara, 223
Dwarf almond, 239
Eels, poisonous, 190
Elateria, 172
Elaterium, 172
Emetia, 271
  morbid appearances from, 272
Empyreumatic oils, 318
Ergot, poisoning with, 307
  analysis of, 307
  symptoms of poisoning with, 308
  treatment do do 309
Ergotism gangrenous, 309
Esculent fungi, 295
Ether sulphuric, poisoning with, 317
  nitric, poisoning with, 317
Ethiops mineral, 126
Euphorbiaceæ, 271
Euphorbia ipecacuanha, 271
  Corrolata, 271
Euphorbium, 173
  officinarum, 174
  cyparissias, 174
  lathyris, 174
  esula, 174
Extract of lactuca, 223
  belladonna, 255
   effects of, 255

Extract of belladonna, duration of effects, 257
  hemlock, 264
  conium maculatum, 264
False Angustura, poisoning with, 278, 285
Fish, poisonous, 188
Flammula, 169
Flesh of animals diseased, 195
Fluids in the body after death, 194
Fly-powder, 99
  stone, 99
Fool's parsley, 263, 267
  symptoms of poisoning with, 268
Foxglove, poisoning with, 275
Fowler's solution, 99
Fumes of burning charcoal, 246, 247
  tallow, 246
Fungi, botanical characters of, 294
  poisonous, distinctive characters of, 294
    sure test of, 294
    principle of, 297
    symptoms of poisoning with, 298
    poisoning with, how relieved, 299
    interval preceding the effects of, 303
    duration of the effects of, 303
    treatment of poisoning with, 304
    morbid appearances from, 305
  Esculent, by what modified, 295
    poisoning with, 295
Gamboge, 180
Gas ammoniacal, 78
  carbonic acid, poisoning with, 244
    how disengaged, 244
    effects of, when diluted, 245
    caution respecting, 245
    treatment of poisoning with, 247
    morbid appearances from, 247
    oxide, poisoning with, 248
  carburetted hydrogen, poisoning with, 244
  chlorine, poisonous effects of, 77
    how neutralized, 77
    experiments with, 77
  hydrochloric acid, 77
Gas, nitric oxide, 75
  symptoms of poisoning with, 75
  oxygen, 250
  sulphurous acid, 78
    antidote to, 79
  sulphuretted hydrogen, poisoning with, 240
    symptoms of poisoning with, 241
    antidote to, 242
    morbid appearances from, 242
    test of its presence, 243
    caution respecting, 243
    treatment of poisoning with, 243
Gases, irritant, 75
  narcotic, 240
Gillenia trifoliata, 271
  stipulacea, 271
Glanders, 196
Globe flower, 169
Gold, poisoning with the preparations of, 141
  fulminating, 141
Grain, diseased and adulterated, poisoning by, 306
Gratiola officinalis, 108
Green vitriol, 161
Hedge-hyssop, 180
Hellebore, black, 270
    symptoms of poisoning with, 270
    morbid appearances from, 270
  white, poisoning with, 273
    symptoms of poisoning with, 274
    morbid appearances from 274
Helleborus fœtidus, 270
  niger, 270
  viridis 270
Hemlock, poisoning with, 263
  treatment of, 265
  morbid appearances from, 265
  extract of, 264
  water of, 265
    symptoms of poisoning with, 266
  dropwort, 266
    poisoning with, 267
Henbane, 221
Hydriodate of potassa, 65
Hydrobromate of do. 66

Hydrochloric acid. See *Acids, Mineral.*
Hydrocyanic acid, antidotes to, 229
  morbid appearances from, 231
  poisoning with, 225
  period at which it is fatal, 228
  preparations of, 226
  salivation by, 227
  symptoms of poisoning with, 226
  treatment for do. do. 229
  vegetables containing, 233
Hydrogen gas, sulphuretted, 240, 243
    carburetted, 244
Hyosciama, 222
Hyosciamus, poisoning with, 221
  its properties, how influenced, 221
  effects in medicinal doses, 222
    poisonous doses, 222
  treatment of poisoning with, 222
  albus, 222
  aureus, 222
  physaloides, 222
  scapolea, 222
Hypophyllum sanguineum, 301
Insects, poisonous, 190, 191
Indian-physic, 271
Indian-turnip, 180
Iodine, 63
  in medicinal doses, effects of, 64
  symptoms of poisoning with, 63
  treatment for, 64
Iodides of mercury, 126
Ipecacuanha, 271
  Spurge, 271
  American, 271
Iridium, muriate of, 159
Iron, poisoning with, 161
  preparations of, 161
  sulphate of, 161
  muriate of, 162
  antidote to, 162
  morbid appearances from, 162
Irritant gases, 75
Irritants, animal, 163
  vegetable, 163
Jalap, poisoning with, 178
Jalapin, 178
Jatropa curcas, 175
  manihot, 176
Juniperus sabina, 179
  virginiana, 179
King's yellow, 100
Lactuca, 221
Lactuca, sativa, 223
  extract of, 223
Laudanum, 205
Laurel,cherry,poisoning with, 236
  mountain do. do. 238
Lead, poisoning with, 147
  symptoms of poisoning with, 147
  treatment of do. do. 152
  morbid appearances from, 154
  antidotes to, 152
  preparations of, 148
  acetate of, 148
  carbonate of, 148
  adulteration by, of articles of food and drink, 325
  mode of preventing the poisonous influence of, 330
  action of air and pure water on, 325
    natural waters on, 327
    distilled water on, 326
    solutions of neutral salts on, 326
    acidulous fluids, 328
Lettuce opium, effects of, 223
Ligature, as an antidote, 34
Lime, action of, 89
  treatment of poisoning with, 90
Litharge, 148
Liver of sulphur, 95
Lobelia, 181
Lobeliaceæ, general properties of, 263
Local action of poisons, 21
Lolium temulentum, 310
Maize, spurred, 310
Manchineel, 176
Manganese, poisoning with, 159
Manganesic acid, 160
Marsh-marigold, 168
Meadow saffron, 273, 274
    morbid appearances from, 275
Meconic acid, 219, 221
Meloe, 184
Mercury, poisoning with, 118, 123, 125
  symptoms of poisoning with, 119, 122, 123
  ready mode of producing its effects, 124
  nostrums containing it, 127
  treatment of poisoning with, 127
  antidotes to, 128
  morbid appearances from, 129

sulphurets of, . . 126
red precipitate of, . 126
nitrates of, . . 126
cyanide of, . 126
prussiate of, . . 126
protochloride of, . 126
protoxide of, . . 126
perchloride of, . 126
subsulphate of, . . 126
iodides of, . 126
ammoniated, . . 126
white precipitate of, 126
Mercurial salivation, treatment of, . 129
Metallic poisons, . . 99
Mezereon, . . 176
Milk, rendered poisonous by lead, . . 329
Milk-sick, . . 196
Mineral acids, . 50, 59
green, 99
turbith, . . 126
Milzbrand, . . 195
Molybdenum, . . 159
Molybdate of ammonia, . 159
Momordica elaterium, 172
Monkshood, . . 268
symptoms of poisoning with, 269
morbid appearances from, 269
Morphia, action of, . 219
preparations of, . 219
treatment of poisoning with, 220
antidote to, . . 221
Mosses, poisonous, . 306
Mountain laurel, . 238
ash, . . 240
Muriate of platinum, . 159
iridium, . 159
rhodium, . 159
palladium, . 159
Muriatic acrid, . . 77
Muscles, poisonous, . 189
Mushrooms. See *Fungi*.
Narcissus Pseudo-narcissus, 177
Narcotico-acrids, . 251
effects of, . 251
whence derived, 252
Narcotic gases, . 240
Narcotics, how they act, . 203
symptoms of poisoning with, 204
morbid appearances from, 204
Narcotine, action of, 219, 220
Narcotism, . . 203
Neutral arsenical salt of Macquer, . . 99
Nickel, sulphate of, . 161
Nicotiana tabacum, . 260
Nightshade, American, . 271
poisoning with, 253, 254
Nitrate of potassa, 86, 87, 88, 89
soda, . 89
Nitre, 86
Nitric acid, . . 50
vapour, . 248
oxide gas, poisoning with, 248
Nitrous acid vapour, . 248
oxide gas, . 248
Nux vomica, . 278, 280
symptoms of poisoning with, 280
dose required to be fatal, 283
smaller doses of, . 282
treatment of poisoning with, 283
morbid appearances from, 284
Oak poison, . . 287
Œnanthe crocata, . 266
Oil of turpentine, . 318
Oils, empyreumatic, . 319
Opium, poisoning with, . 205
mode of action of, 205, 206
remote effects of, . 205
preparations of, . 205
effect of, in small doses, 206
symptoms of poisoning with, 206
period preceding its action, 208
delirium produced by, 209
duration of poisoning with, 211
treatment of poisoning with, 211
antidote to, . . 216
morbid appearances from, 217
Orpiment, . . 100
Osmium, oxide of, . 159
Overdriven cattle, . 194
Oxalic acid, . . 66
Oxygen gas, . . 250
Oysters, . . 189
Palladium, muriate of, 159
Papaveraceæ, general characters of, . . 224
Parsnip, . . 181
Pastinaca sativa, . 181
Peach, . . 288
Pearson's solution, . 100
Pepper, poisoning with, . 161
Phosphorus, poisoning with, 60
experiments on, . 60
effects of, . . 60
morbid appearances from, 61
treatment of poisoning with, 61
Phytollacca decandra, . 271
Piper betel, . . 182

Piper siriboa, 182
  inebrians, 182
  cubebae, 182
Platinum, muriate of, 159
Plumbago Europea, 181
Poison oak, 287
  vine, 288
  of the viper, 191
  of snakes, effects on different organs, 181
Poisoning, compound, how affected, 320
Poisonous bacon, 198, 201
  cheese, 198, 200
  fish, kinds of, 188
  fungi, 294, 305
  sausages, 198
Poisons, how they occur, 33
  division of, 37
  tabular view of, 38
  irritant, 44
    symptoms produced by 44
    morbid appearances from, 48
Pomaceæ, 239
Potatoe fly, 184
Prunus padus, 239
  avium, 239
  insititia, 239
  spinosa, 239
  cerasus, 239
  virginianus, 239
Prussic acid, 225
Putrified animal matter, 193
Ranunculaceæ, general properties of, 167
  poisoning with, 165, 268
Ranunculus, most common species of, 166
  acrid principle of, 167
Realgar, 126
Red-lead, 148
Red-precipitate, 126
Rhodium, muriate of, 189
Rhododendum chrysanthemum, 181, 238
  ferrugineum, 181, 238
Rhus radicans, 180, 288
  toxicodendron, 180, 287, 288
  vernix, 289
  pumilum, 290
Ricinus communis, 194
Rye. See *Ergot.*
Sal ammoniac, 90, 91
Savin, poisoning with, 179
Sausages, symptoms of poisoning with, 199
  morbid appearances from, 200
  in what the poison consists, 200
Scammony, 179
Scheele's green, 99
Scillitin, 272
Scorpion, 191
Secale cornatum, 307
  analysis of, 307
  symptoms of poisoning with, 308
  treatment for, 309
Sedum acre, 180
Silver, nitrate of, poisoning with, 140
  treatment for, 140
Sloe, 239
Snakes, venomous, 190
Solaneæ, general characters of, 253
Solanum, 221
  dulcamara, 223
  nigrum, extract of, 224
  fuscatum, 224
  mammosum, 224
Sorbus aucuparia, 240
Spurred maize, 310
  rye, 307
Squill, poisoning with, 272
  symptoms of poisoning with, 272
  quantity which has poisoned, 273
  chief preparations of, 273
  morbid appearances from, 273
Stavesacre, 168
St. Ignatius bean, 278, 284
Strontia, salts of, 158
Strontium, 158
Strychnia, poisoning with, 278, 279
  symptoms of poisoning with, 279
  treatment for, 280
  antidotes to, 280
Sulphate of copper, 132
    of iron, 161
    of zinc, effects of, 145
    treatment for, 147
    antidote to, 147
Sulphur, poisoning with, 62
Sulphuretted hydrogen gas, 240, 243
Sulphurets, alkaline, 95
  of potassa and soda, 95
Sulphuric acid, 50
  ether, poisoning with, 317
Sugar of lead, 148
Swamp sumach, 289

Sweet-scented virgin's bower, 169
Tarantula, . 191
Tartar emetic, . . 136
  symptoms of poisoning with, 136
  effects of, . 137
  local effects of, . 138
  treatment of poisoning with, 138
  morbid appearances from, 139
Thorn-apple, poisoning with, 253, 254
  symptoms of poisoning with, 259
  treatment for, . 260
  morbid appearances from, 260
Thymelæ, general characters of, 176
Ticunas, . 278, 287
Tiglin, . . 182
Tin, poisoning with, . 140
  preparations of, . 140
  morbid appearances from, 140
Tithymaloidæ, . 173
Tobacco, poisoning with, 253, 260
  effects of, . . 260
    externally, . 261
  treatment for, . . 262
  morbid appearances from, 262
Toothwort, . 181
Traveller's joy, . . 169
Trollius, . 169
Tungstate of ammonia, . 160
Turbith mineral, . 126
Umbelliferæ, . 263
Unripe grain, 310
Upas antiar, . 288, 293
Upas tieuté, 278, 284
Uranium, poisoning with, 160
Vegetable acrids, . 163
  irritants, . . 163
Venomous snakes, poisoning by, . 190
    symptoms of, 190
  Insects, . 190
Veratra, . 273
  antidotes to, . 273
Veratum album, . . 273
  sabadilla, . 273
Vermilion, . 126
Verniere's method of applying ligatures, . 35
Violaceæ, . 271
Viper, treatment of poisoning by, . 192
    as practised by the S. A. Indians, . 192
Vitriol, blue. See *Sulphate of Copper.*
Water, action of, on copper, 321
    on lead, 325
Water-hemlock, . 265
White-precipitate, . 126
    vitriol, 145
Wild-cherry, . 239
Woorara, 278, 287
Zinc, poisoning with, . 145
  preparations of, . 145
  sulphate of, its effects, . 145
    treatment for, . 147
  antidote to, . 147
  morbid appearances from, 146